The Veterinary Record.

(*Founded by William Hunting, F.R.C.V.S., 1888.*)

No. 37. SEPTEMBER 12, 1925. Vol. 5.

Rations for Normal Animals.*

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I take it that in his ordinary practice the veterinary surgeon is more frequently asked to advise on the feeding of abnormal or diseased animals than on the rationing of normal healthy animals. In my case the converse happens. I know little about the care of sick animals, but I have given some years of thought and experiment to the rationing of healthy animals. Exchange of views between the veterinary profession and people like myself may therefore throw some light on the problems of animal nutrition. This is my excuse for venturing to lay before the National Veterinary Medical Association my views on the rationing of the normal animal.

The first point I wish to raise is the origin of our present methods of feeding live stock; and since one must start somewhere, I propose to start about 150 years ago, when the growing of root crops first became general. Before this date animals were kept, or perhaps I should say, starved, through the winter on straw and hay with perhaps a little corn. Fresh meat and milk in the winter were almost non-existent. The advent of the root crop caused what one might almost call a revolution, since it enabled the farmer to maintain all the year round a constant supply of fresh meat and milk. At first winter rations consisted of roots with straw and a litfle hay, and it was not until 1830 or thereabouts that concentrated feeding stuffs began to be tried. It was about this time, too, that chemical analysis reached the stage at which it could be applied to the problems of the agriculturist. One of its first achievements in this direction was the demonstration that the muscles of animals consisted of albuminoids, and that they stored food in their bodies mainly as fat. From these facts chemists jumped to the conclusion that the working animal needed abundance of albuminoids in its diet, and that these same albuminoids and oil were of predominant importance in meat production.

These theories were taught a hundred years ago, in the days of the great landlords: Coke of Norfolk; "Turnip" Townsend, the Duke of Bedford, who spread them far and wide by their example, through the Holkham gatherings, the Woburn sheep shearings, and the first agricultural shows. The opportunity for putting them into practice came at the same time by the advent of linseed and cotton cake and other concentrated feeding stuffs rich in albuminoids and oil. The extravagant use of these and other similar materials was adopted as a necessary adjunct to roots and straw for winter feeding, and was encouraged by the prosperity of farming from 1840 to 1870, during which period it was incorporated into general farming practice.

This, in brief outline, is the origin of our present methods of feeding live stock. They have a certain scientific basis, but the science is unfortunately the somewhat crude chemistry of a hundred years ago. One may ask why the newer science has not replaced them. The answer is that the newer science of nutrition, based on physiological investigations on living animals rather than on chemical analysis of dead carcasses, did not begin to produce results until the agricultural depression of the last quarter of the nineteenth century had swept away the great landlords, who were the active agents in spreading scientific knowledge. To-day a new and very active agent for spreading knowledge has come into being—the county agricultural organiser—and through him the newer science of nutrition is beginning to spread. He has made a good start with rationing for milk, and he will ultimately succeed with rationing for the production of meat. But he has a large area to cover and wants all the help he can get, and no one can help him more than the veterinary profession. Incidentally, in helping him the profession will help itself. I do not know much about veterinary matters, but I take it the farmer seldom seeks professional advice in the case of individual sheep and pigs suffering from disease. He thinks it would not pay him to do so; but if he finds that he can get advice which will improve or cheapen his yield of meat or milk that is quite another matter.

Having pointed out how our methods of feeding originated, the next point I propose to discuss is where we are wrong, and this point falls naturally under several heads, which need separate discussion.

Feeding for Milk.—Everyone knows that milk contains about 4 per cent. of protein—the modern name for albuminoids. Everyone knows that a gallon of milk weighs just over 10 lb. It follows, therefore, that a gallon of milk contains nearly ·5 lb. of protein. The protein of milk is a special kind of protein differing from the proteins contained in fodders. Food protein is, therefore, not changed by the cow into milk protein without loss. Consequently somewhere between ·5 and ·6 lb. of food protein is used up in making the protein of a gallon of milk. This is beginning to be understood, but there are still hundreds of cow keepers who feed all their cows alike, instead of giving each cow a ration supplying protein in proportion to her yeild at the rate of just over ½ lb. of digestible protein per gallon.

Most cows are still underfed as regards protein. Result: drop in yield and ill health.

Feeding for Growth.—It is now well recognised that young growing animals, if they are to thrive and maintain a normal growth rate, require definite and

*Presented at the Annual Congress of the N.V.M.A., Cambridge, August, 1925.

rather large amounts of protein and ash constituents, more especially lime and phosphoric acid. Hundreds of farmers still feed their young pigs on a diet of cereal meals alone, though these feeding stuffs are deficient in protein and in lime. It is, perhaps, still more usual to winter store stock on roots and poor hay, or sometimes even straw, and such a diet is deficient in protein and ash for the maintenance of healthy growth.

Fattening Sheep and Cattle in the Winter.—Lawes and Gilbert as far back as 1853 showed that most of the fat stored in fattening animals was produced by carbohydrates such as sugar and starch. This has been repeatedly confirmed in more recent years, for instance by Kellner, who showed among other things that protein, though it can produce fat, is not as good a source of fat as is carbohydrate. Nevertheless it is the almost universal practice to include in the ration of fattening sheep and cattle large quantities of cakes and meals, made from oil seeds, which are excessively rich in protein and comparatively expensive. Besides being uneconomical, this practice is dangerous in the case of sheep. On several occasions I have found sheep which had died suddenly on such rations to have diseased kidneys and albuminous urine in their bladders.

Summary.—It appears therefore that the present traditional method of feeding gives excessive protein to fattening animals, and witholds from milch cows and young stock the protein and ash constituents which they urgently require.

Horses.—I speak to the Veterinary Profession on the subject of horses with great diffidence. There is, however, one point which I feel I must mention. Kellner in his starch equivalents has given us a relative measure of the nutritive value of feeding stuffs. The starch equivalent of oats is 60 lb. starch equivalent per 100 lb. of oats. The starch equivalent of maize is 80, so that 80 lbs. of oats only contain as much real nutritive value as 60 lbs. of maize, or 1 lb. of oats is equivalent to $\frac{3}{4}$ lb. of maize. No wonder, therefore, that horses go wrong when oats are replaced by maize pound for pound.

Again, the starch equivalent of bran is only 45, so that 1 lb. of oats is equivalent to $1\frac{1}{3}$ lbs. of bran. That is why horses go to pieces when bran replaces oats pound for pound. It is wonderful what a variety of feeding stuffs can be used to replace oats for horses if the replacement is made in proportion to the starch equivalents.

Modern Methods of Rationing.—So far I have dealt with the subject historically and critically. It only remains to set out a series of constructive suggestions for rationing various kinds of animals on modern lines. The information on which these suggestions are based is derived in large part from investigations carried out by myself and my colleagues. The rest has been collected by diligent study of the copious literature on the subject which is scattered through many books and periodicals.

The first requisite in feeding animals of any kind is a good practical knowledge of the properties of feeding stuffs—which feeding stuffs are palatable, wholesome and health producing for each kind of stock; which are binding; which are laxative. On such points I need say nothing. My audience know more about this branch of the subject than I do.

The next thing is a knowledge of the chemical composition of feeding stuffs, and in this connection the important points are (1) percentage of dry matter; (2) percentage of starch equivalent; (3) percentage of digestible protein. All these particulars for average samples of about 300 common feeding stuffs and fodders are set out in the tables at the end of "Rations for Livestock," whch can be obtained from the Ministry of Agriculture, post free 6d.

The importance of knowing these three constituents is as follows. The capacity of an animal's appetite is best measured in terms of dry matter. Starch equivalent best sums up the real nutritive value of a feeding stuff for producing work, growth, meat or milk. Every animal requires a certain minimum of digestible protein in its daily ration.

The next step is to realise that the food requirements of an animal are made up of two parts. One part is required to provide for the ordinary vital functions of the animal—respiration, circulation, digestion, etc. This is called the maintenance ration and is related to the live weight of the animal by a definite law, being proportional to the square of the cube root of the live weight. To work out the maintenance ration from this law requires considerable mathematical skill. It is more easily obtained by consulting the tables given below.

The second part of the ration, called the productive ration, is not related in any way to live weight, but is proportional to the result which the feeder desires to produce. For milch cows it is computed at the rate of $2\frac{1}{4}$ to $2\frac{1}{2}$ lbs. of starch equivalent, including ·5 to ·6 lbs. of digestible protein, which roughly means about 3 to $3\frac{1}{2}$ lbs. of cake and meal mixture, per gallon of milk.

For growing and fattening animals the productive ration is proportional to the rate of live weight increase which the feeder desires to produce. Unfortunately the relation is not a simple one, for whilst milk is fairly constant in composition, live weight increase is not. The live weight increase of a young animal consists for the most part of water, with only small amounts of protein, fat and ash. As the animal gets older, the increase contains less water and more fat. Consequently, comparatively little food will make a pound of increase in a young animal—half a pound of meal will make a pound of live weight increase in a newly-weaned pig. Older animals want more food per pound of increase. A nearly fat bacon hog eats about 4 lb. of meal in making a pound of increase. Tables are printed below giving the relation between food and growth rate of various kinds of animals. These tables also show the capacity of the appetite in terms of dry matter, and the daily requirement of digestible protein.

In order to use these tables it is necessary to know the live weight of the animals to be rationed.

This, of course, is best found by weighing. In the absence of a weighing machine, most livestock owners consider themselves capable of judging live weight, but in my experience they are not as good judges as they think they are.

Table I for Rationing Cattle

Live weight is stated in cwt.

Appetite in lb. dry matter per day.

Maintenance ration in lb. starch equivalent per day.

Requirement per lb. live weight increase in lb. starch equivalent per day.

Protein requirement per day rises gradually from 1¼lb. at 7 cwt. live weight to 1½lb. at 9 cwt.

Live Weight cwt.	Appetite lb. dry matter.	Mainten'nce ration—lb. starch equivalent.	Requirem't pr lb. L.W.I. lb. starch equivalent.	Remarks.
7	19	5·0	2 2¾	young stores. half fat.
8	20½	5·5	2¼ 3	stores. half fat.
9	22	6·0	2½ 3¼	stores. half fat
10	23½	6·5	2¾ 3½	stores. half fat.
11	25	7·0	3 3½	stores. half fat.
12	26½	7·4	3 3½ 4	stores. half fat. nearly fat.

Table II. for Rationing Milch Cows.

Units as before.

Live Weight cwt.	Appetite lb. dry matter.	Maintenance requirement. lb. starch equivalent.	Maintenance requirement. lb. digestible protein.
8	23	5·5	·6
9	24½	6·0	·7
10	26	6·5	·7
11	28	7·0	·7
12	30	7·4	·8

Productive ration per gallon of milk:—
2½ lb. starch equivalent; ·6 lb. digestible protein.

Table III. For Rationing Sheep.

These figures refer to sheep 6 months to 12 months old folded on roots in the autumn, winter and spring. Live weights ranging from 100 lb. to 150 lb.

Protein requirement ·25 lb., rising to ·3 lb. digestible protein per day.

Live Weight lb.	Appetite lb. dry matter per day.	Maintenance ration—lb. starch equivalent per day.	Requirement per lb. L.W.I. lb. starch equivalent.	Remarks.
100	3	·72	2½	
120	3·5	·84	3	
140	3·8	·92	3½	
160	4·1	·99	4	

Table IV. for Rationing Pigs.

Live weight stated in pounds.

Appetite in pounds of meal per day.

Maintenance requirement in calories per day.

Requirement per lb. live weight increase in calories per day.

N.B.—1 lb. average mixed meal—say barley meal and middlings containing 10 per cent. fish meal =1,000 calories.

Protein requirement in lb. digestible protein per day.

Daily ash requirement for pigs of all weights =10-12 gm. =⅓ oz. each of CaO and P_2O_5.

Live Weight lb.	Appetite lb. meal.	Maintenance ration. Cals.	Requirement per lb. L.W.I.	Protein requirement. lb. digestible protein.
30	1·3	900	650	·27
40	1·9	1300	600	·28
50	2·3	1600	600	·30
60	2·8	1800	700	·35
70	3·2	2000	730	·40
80	3·6	2150	770	·42
90	4·0	2200	820	·45
100	4·2	2250	950	·50
125	5·0	2400	1300	·52
150	5·8	2500	1500	·55
200	7·3	2550	2100	·60

In conclusion it may be useful to work out a few typical rations in order to illustrate the method of using the tables.

Example I.—Ration for topping up 12 cwt. half fat three-year-old bullocks for Christmas trade. Fodder available, swedes and barley straw. Question: What sort of concentrated food to use and how much?

From Table I., twelve such bullocks will eat about 26½ lbs. of dry matter per day. Their maintenance ration is 7·4 lbs. of starch equivalent per day; the protein requirement 1·5 lbs. digestible protein. Their maximum growth rate will be 2 lb. increase per day, which will require 7 to 8 lbs. of starch equivalent for its production. Adding this latter figure to the maintenance ration, it appears that they should get in their total ration about 15 lbs. of starch equivalent per day.

Their total ration should therefore contain 26½ lbs. dry matter; 15 lbs. of starch equivalent; 1·5 lbs. digestible protein. This ration must contain in 26½ lbs. of dry matter, 15 lbs. of starch equivalent; in other words, the dry matter must contain about 60 per cent. of starch equivalent.

Barley straw contains 86 per cent. of dry matter in which there is only 19·5 per cent. of starch equiva-

lent. Its dry matter, therefore, contains only 23 per cent. of starch equivalent. Evidently the total ration of these animals cannot include much barley straw, for it is too bulky in proportion to its starch equivalent. Swedes contain 7·3 per cent. of starch equivalent in 11·5 per cent. of dry matter, or 63 per cent. of starch equivalent in their dry matter. They are therefore suitable for making the greater part of the ration. Not the whole, however, as they contain too little protein and too much water. A ration which supplies the desired amounts of dry matter, starch equivalent, and digestible protein will be 4 bushels of swedes, 5 lbs. of straw and 1 to 2 lbs. of cake according to quality. Some animals will not eat so many swedes, in which case part of the swedes can be replaced by some such material as maize meal at the rate of 1 lb. of meal for 11 lbs. of swedes, or 4 lbs. of meal for 1 bushel of swedes.

Example II.—Ration for a milch cow yielding 4 gallons of milk per day; live weight 11 cwt.

	Starch equivalent.	Dig. Protein.
Maintenance ration, 11 cwt. cow ...	7·0 lbs.	·7 lbs.
Productive ration for 4 gallons at 2½ lbs. starch equivalent and ·6 lb. digestible protein per gallon ...	10·0 lbs.	2·4 lbs.
Total ration	17·0 lbs.	3·1 lbs.

This must be got inside the limits of the cow's appetite, which is not more than 30 lbs. of dry matter.

It will be found that the cow's maintenance requirements will be satisfied by about 18 lbs. of fairly good hay which contains about 14 lbs. of dry matter.

The production ration will need 3 to 3½ lbs. of cake and meal mixture per gallon, or 12 to 14 lbs. for the 4 gallons. This will contain 10½ to 12½ lbs. of dry matter, so that the total ration will contain 24½ to 26½ lbs. of dry matter which the cow would eat easily. In fact she would eat rather more, for instance, she might get not more than 1 bushel of roots or green stuff which she would require if the hay was not very good.

Example III.—Ration for 7 months old sheep on swedes, to fatten in 4 to 6 months. Average live weight 100 lbs.

From Table III. such sheep will eat per day 3 lbs. of dry matter which must supply ·72 lbs. of starch equivalent for maintenance and 2½ lbs. of live weight increase. The protein requirement per day is ¼ lb. digestible protein. For fattening, their growth rate should be about ·3 lb. live weight increase per day, which at 2½ lbs. of starch equivalent per lb. increase requires ·75 lb. starch equivalent per day. Their total ration therefore should contain in 3 lbs. of dry matter about 1½ lbs. of starch equivalent including ¼ lb. of digestible protein; or per week, 21 lbs. of dry matter, 10½ lbs. of starch equivalent and 1¾ lbs. of digestible protein.

Sheep of this age and size when folded on roots will eat about a stone per day, which works out at about 100 lbs. per week. This amount of swedes contains 11·5 lbs. of dry matter, 7·3 lbs. of starch equivalent and ·7 lb. of digestible protein, taking a figure for the protein half way between crude protein and pure protein.

In addition to this it is usual to give them 1 lb. per head per day of good quality hay—probably seeds hay—which will supply 6 lbs. of dry matter, 1·66 lbs. of starch equivalent and ·43 lb. of digestible protein per week.

The swedes and hay together, therefore, supply the following weekly ration:—

Dry matter 17·5 lbs., starch equivalent 8·96 lbs., and digestible protein 1·13 lbs.

Subtracting this from the amounts required, the deficiency is 3·5 lbs. dry matter, 1·54 lbs. starch equivalent and ·62 lb. of digestible protein. The mixture of concentrated foods suitable for supplying this deficiency should contain about 16 per cent. of digestible protein and 40 per cent. of starch equivalent. The important thing is that it should supply about the right amount of protein.

There is no better mixture for sheep than decorticated cotton seed cake or meal and barley, in the proportion of 1 part of the former to 2 parts of barley. The mixture will contain 16 to 17 per cent. of digestible protein. Of such a mixture 4 lbs. per week, or a shade more than ½ lb. per day will supply ·65 lb. of digestible protein in 3½ lbs. of dry matter. It will contain nearly 3 lbs. of starch equivalent—rather more than the deficiency—but that is a mistake on the right side which the sheep will correct by eating rather less swedes.

As the sheep grow and fatten they will naturally require a larger ration because their maintenance ration will increase and their live weight increase will require more starch equivalent per lb. They will eat more roots to make up part of their extra requirements, but it is also advisable to increase their concentrated ration in stages up to 1 lb. per head per day.

Discussion.

The discussion was opened by Mr. Henry Taylor, F.R.C.V.S., who said:—

The National Veterinary Medical Association is to be congratulated I think, on the subjects selected for discussion at the Congress, of which the one by Professor Wood is a very important component, particularly in view of the fact that immense strides have been made lately in the feeding of animals. Sir Daniel Hall also referred in his address yesterday to this importance.

Professor Wood is further to be congratulated on compressing so much of an encyclopædic subject, or rather of its principles, into the limits of a short paper. Rations for animals include the feeding of young and old—of the horse, ox, sheep and pig, not to mention those branches for producing milk, flesh, fat and work, or taking into account the different digestive organs.

Generally speaking, veterinary surgeons are not often consulted about the rations for animals, unless or until one of them falls ill, or develops some ailment, such as a skin affection, which the owner attributes to the food. But one can occasionally assist the owner

by enquiring into the food and suggesting an alteration. Let me cite an example or two. Last winter two yearling bullocks died after having had diarrhœa. A *post-mortem* revealed no sign of Johnë's disease. On enquiring into the feeding, it was ascertained that the ration consisted of roots, hay and molassine meal. It did not require much expert knowledge to say that that ration was deficient in protein, with an excess of carbohydrates, for a growing animal. A little linseed cake and crushed oats were suggested, and there were no more cases. Incidentally I may remark that the owner's cows were getting the same ration and the owner was surprised at the increase in milk when they too received the amended ration.

At another place a herd of Friesian cows gave milk with only 2·9 per cent. of fat. There again, the substitution of a few pounds of linseed and cotton cakes brought up the average to 3·9. These bear out the statement in the paper about cows being "underfed as regards protein." Some pigs at another farm had digestive troubles and did not thrive, though there were no deaths and no evidences of swine fever. On reckoning up the various items in the analyses of the foods, it appeared that they were getting nearly half pound of mineral matter each per day. That was chiefly due to a certain pig meal which was said to be a "balanced and complete ration for pigs."

Professor Wood, with his usual clarity of expression and profound knowledge of the subject, makes the rationing of animals seem quite a simple matter. But is it? The first point in which we may go astray is the chemical analysis. These vary somewhat for the same grain—*e.g.*, oats grown in that part of the British Isles which is noted for the production of a popular beverage, vary in composition from those grown in the South and in Canada, whilst those grown in South America are positively bitter and not relished by horses. Another point in which we may go wrong is that animals in thriving condition seem to make more use of a ration than those which have been starved. Further, the digestible nutrients, as given in our tables of analysis, cannot be the same for the different animals—horse, ox, sheep or pig, particularly as regards the carbohydrate portion. Also, it is possible to get a diet for a milk cow correct as to the amount of starch equivalent, etc., but which will upset the cow's digestion. A mixture of cotton seed meal, clover hay and maize germ meal causes constipation, sends the cow off her feed and as a result there is hardly any milk, though *theoretically* it is a good milking ration.

Proteins are, on the whole, the most expensive constituents and the problem is complicated by the fact that all proteins are not of the same nutritive value. Their value depends on the proportion in which their constituents—the amino-acids—are present, and our information on this subject is far from complete (Report 1922, Rowett Institute).

The point I wish to make is that the subject of animal rations is not so easy as it appears at first sight and that some latitude for individual requirements and for our incomplete knowledge must be allowed; the real crucial test is the practical value.

Professor Wood has enumerated the principles governing the feeding of animals, the chief one being the adoption of a maintenance part, which is supplemented by a production portion according to the result it is desired to achieve—milk, growth, fat or work. It might have been advisable just to mention the vitamines. Green food is rich in A, B and C—hence the necessity for the provision of a diet containing some green food wherever possible. Our knowledge of vitamines is yet incomplete. They are certainly present in varying amounts in every foodstuff in its natural condition. B is chiefly found in the germ of seeds, and C in swedes. A curious result was obtained, however, in South Africa by Theiler, who found that cattle could live for months on a diet so deficient in B that it caused death in fowls in a few weeks.

The production and maintenance ration finds its *best* application in the case of the cow giving milk, and I propose to give the figures in use in Sussex. These have been furnished to me by Mr. Jesse, the director of the County Council. Approximately they are the same as those of Professor Wood, and from my observation of the herds in which they are used, they appear to be quite correct.

Appended are two examples:—

TABLE I.

Lbs. per Cow per day.		Dig. Protein.	Starch Equiv.
		lbs.	lbs.
Hay, good	15	·57	4·50
Straw	8	·18	2·00
Swedes	50	·10	3·50
Cotton Cake	2·5	·85	1·77
Cake Kobs	2·5	·47	1·55
Dried Grains	4·5	·60	2·25
Totals	...	2·77	15·57
Scientific Requirements.		Dig. Protein.	Starch Equiv.
Maintenance Ration (1,200lb. Cow)		·84	7·50
Production Ration (3 galls. of Milk)		1·74	7·50
Totals	...	2·58	15·00

REMARKS:—A well balanced ration and an excellent yield.

NOTE.—The following is an actual example of extravagant feeding. The milk, in this case, at the market price of food, was costing for food alone not less than 6s. per gallon.

TABLE II.

Lbs. per Cow per day.		Dig. Protein.	Starch Equiv.
		lbs.	lbs.
Hay, poor	13	·45	3·24
Mangolds	98·3	·10	6·88
Turnips	4·6	·01	·28
Cabbage	82·45	1·23	7·42
Linseed Cake	4	1·00	3·00
Potatoes	7	·01	1·33
Sharps	4·6	·51	2·66
Oat & Hay Chaff	5	·11	1·25
Out to Grass	... ...		
Totals	... ...	3·42	26·06

Scientific Requirements.	Dig. Protein.	Starch Equiv.
Maintenance Ration (1,200lb. Cow)	·84	7·50
Production Ration (1½ gall. Milk)	·87	3·70
Totals	1·71	11·20

REMARKS.—This ration is very extravagant unless the animals are being fattened. The ration contains twice the normal requirements of animals yielding 1½ gallons of milk.

TABLE III.

Lbs. per Cow per day.	Dig. Protein.	Starch Equiv.
Meadow Hay Fair 15	·57	4·50
Mangolds 20	·02	1·40
Bran 3	·30	1·41
Oats 1	·09	·63
Dairy Cake 6	·90	3·60
Totals ...	1·88	11·54

Scientific Requirements.	Dig. Protein.	Starch Equiv.
Maintenance Ration (1,000lb. Cow)	·70	6·25
Production Ration (2 gal. milk) ...	1·16	5·00
Totals	1·86	11·25
		Average of Farms last month.
Average Daily Yield of Milk per Cow	2·10 gall.	2·16 gall.
Average Daily Cost of Ration ...	19½ pence	20½ pence
Average Cost of Food per Gallon Milk	9¼ pence	9¾ pence

REMARKS.—A well balanced and economical ration.

A farmer frequently ascribes an increase or decrease in the milk yield to some erroneous factor, but generally speaking, an increase in the amount of roots fed up to a certain point increases the milk yield. This may be seen from the following table (also kindly supplied to me by Mr. Jesse).

TABLE IV.

ROOTS.

(Excluding all Herds Feeding no Roots).

	Average Yield of Milk per Cow.	Average amount of Roots fed per Cow.
	Galls.	lbs.
1st 100 Herds (Lowest) ...	1·37	27·92
2nd ,, ,, ...	1·61	31·23
3rd ,, ,, ...	1·74	29·28
4th ,, ,, ...	1·86	36·66
5th ,, ,, ...	1·97	33·51
6th ,, ,, ...	2·03	33·00
7th ,, ,, ...	2·11	36·03
8th ,, ,, ...	2·18	38·92
9th ,, ,, ...	2·26	40·54
10th ,, ,, ...	2·35	38·41
11th ,, ,, ...	2·46	41·62
12th ,, ,, ...	2·57	41·57
13th ,, ,, ...	2·78	42·22
14th (87) ,, (Highest)	3·26	47·52

As hay is at present cheap, there is a tendency to feed too much, but there is a limit to the amount which can be *profitably* fed—this seems to be about 18lbs. On the other hand, there is a minimum. Kellner put it at 5lbs. per 1,000lbs. live weight. Some people who keep Jersey cows try to keep down the bulky ration and feed a maintenance ration of 10lbs. of hay, 6lbs. root or cabbage, 3lbs. bran, 1lb. oats, and a production ration of 3lbs. of the following mixture per gallon of milk yielded. 1 part maize germ meal, 2 parts linseed cake (9 per cent. of oil), 3 parts bran meal and 3 parts semi-decorticated ground nut cake.

That method of feeding seems to suit Jerseys, which require to be fed rather above the average owing to the richness of their milk. A Jersey cow will only weigh about 825lbs. A *number* of feeding stuffs—probably owing to being more palatable—seems to be better for milk production than just feeding, say, one or two kinds of concentrated food. Experiments in feeding animals are difficult to put into their true perspective. An experiment conducted by the secretary of the Agricultural Committee of the Lancashire County Council is interesting. Two lots of cows were taken and, in addition to a maintenance ration, one lot was fed with 3lbs. of a mixture of, palm kernel cake 2 parts, decorticated ground nut cake 1 part, maize meal 2 parts, for each gallon of milk, and the other lot with 4½lbs. The latter only yielded 1lb. of milk per day per cow more, and the effect on the live weight increase was negligible. The lot were reversed to control the experiment, with identical results. We may deduce from the above that it is not profitable to feed more than the standard. The question might be asked, why did these cows not put on weight?

A point not to be lost sight of in rationing cows is the fact that a cow giving 2½ gallons of milk per day requires 3⅓ozs. of lime and 2⅓oz. of phosphoric acid in the daily supply.

RATIONS FOR GROWING ANIMALS.

The maintenance requirements for *calves* have, I believe, not been scientifically worked out, and as no mention is made in the paper under discussion of rations for animals under 7 cwt., we must conclude that only general principles apply to them, the chief one being the provision of plenty of protein matter to make muscle and mineral substances to form bone.

As Professor Wood points out, live weight increase is not constant in its composition, and it might be convenient and simple to construct a table for calves on the basis of the live weight of the animal, taking age into consideration and giving total dry matter in the feed per day with the digestible nutrient per 1,000lb. live weight, after the feeding standards of Kellner. The complete table is somewhat as follows for 3—6 month animals (the full table can be got by referring to the book).

	Digestible Nutrients per day per 1000lbs. weight.					
	Total dry matter	Digestible Protein.	Starch Value.	Crude Protein.	Fat.	N. from extract and crude fibre.
Heifers for Stock 3—6 months 280lbs. ...	24	2·8	15·2	3·1	1·0	13·0
Steers for fattening. 3—6 months 300lbs. ...	24	3·5	16·5	4·0	2·0	13·0

There is no separation of the ration into maintenance and production portions; it does not seem very applicable to animals of that age. From the above table, it is easy to reckon out the nitrogenous ratio which, in my opinion, is an important point to keep before the farmer. Generally speaking, foods rich in protein are expensive—hence he wants to avoid buying, if he thinks he can do without. I have seen calves brought up on oats, which is a well-balanced food, do remarkably well.

In the County of Sussex there has been for the last two years an institution known as the Sussex Baby Beef Club, which institution buys calves of the breed indigenous to Sussex and hands them to farmers' children to bring up. They are sold at the end of the year, prizes are given and the net profit goes to the children.

The first and second prize animals came from one farm and were fed together. Their weights on September 1st were 340lbs and 450lbs., and they gained in four months 634 and 683lbs. respectively. They were kept in a loose box all the time and did not go out to grass. Each animal consumed:—

880lbs. linseed cake
267lbs. crushed oats
1213lbs. hay
3843lbs. roots
1097 maize meal
} = 386·6lbs. digestible protein or a little over 1lb. per day.

I have particulars of the feeding of sixteen calves for the following year, but it will take too long to discuss the lot and I do not want to inflict too many figures upon you.

After the growing animal has reached the weight given in Table 1 of the paper, the figures given by Professor Wood apply, but I should just like to ask him if they are the results of experiments which *he* has supervised, because I am rather sceptical of accepting conclusions as regards feeding, from experiments conducted out of this country. At any rate the figures seem to be about the same as continental authorities. One might just mention here the effect of feeding bone meal to animals in South Africa, which produced growth, perhaps owing to the phosphorus.

Rations for Colt. One must go on general principles here and the provision of muscle and bone forming substances is essential. The first winter, or rather the feeding during that period, makes or mars a colt. Grass itself will not do, but 3 or 4lbs. of oats and ½lb. of bran (more or less, according to the breed of horse) per day, is the line to go upon. Colts stinted during their first winter never seem fully to recover. Lucerne and the clovers, being rich in lime, are useful for bone formation—they form adjunctions to the bran, which though rich in phosphates is poor in lime.

Rations for Pigs. Surrounding temperatures seem to have greater influence on pigs than on other animals, but is there any need to reckon the maintenance requirement in calories per day? It might be somewhat difficult to get at the calories in a bucket of hotel swill—a common food for pigs. Personally I think the table given in Professor Wood's *Rations for Livestock* a much simpler method of rationing and more easily understood by the people concerned. An important point in the feeding of pigs (particularly of sows with young and young stores), is that stressed in Table 4, *viz.*, the daily ash requirements: ⅓ gr. each of CaO and $Pr.O_5$. The lack of Fe, in feeding stuffs, speaking generally, is of exceptional occurrence, but the Rowett Institute experiments proved that a deficiency of that metal causes trouble amongst young pigs, which is shown as diarrhœa or a kind of white scour. I must confess that, although one frequently comes across diarrhœa in pigs, I never suspected that want of Fe could be a cause. To revert to the CaO and $Pr.O_5$, it is only the growing pigs which need them. When the fattening process comes on it does not matter whether the bones develop or not. It has been recommended to give the CaO for a few days and then the $Pr.O_5$ for a day or two; if given together, they combine and are not so easily made use of by the digestive organs when the digestive tract is alkaline.

The eagerness with which young pigs and young calves too lick the limewashed walls of their box indicate their want of that substance.

There is another chemical substance which has formed the subject of investigation as far as the pig is concerned, *viz.*, Iodine. Many pig feeders and breeders in my locality use a small amount of KI in their mineral ration, and investigations seem to point to the fact that in some cases of high mortality amongst new born pigs, there is a disease present which can be prevented by the administration of KI to the sow. (Smith and Dennis).

Fattening Pigs.—Feeding experiments are very confusing. Here is one which was very kindly made for me by a farmer:—

Two rations for pigs which, according to the starch equivalent, should have given almost identical results, did not "pan out."

Four pigs were fed on rations A.—A mixture of green meat Q.S., barley meal 65%, middlings 25%, fish meat 10% and ate 360lbs. of the food for 149½lbs. increase, which is 2.4 for 1lb. increase.

Four pigs fed on B., which was palm kernel meal 65%, middling 25%, fish meal 10% and the usual amount of green food, ate 321lbs. of meal for 92½lbs. increase, which indicated 3.52lbs. for 1lb. increase.

THE "SUSSEX" BABY BEEF CLUB.

STATEMENT OF LIVE WEIGHTS, COSTS, PROFITS AND GAINS FOR THE YEAR ENDED 31ST AUGUST, 1923.

Sex of Calf.	Weight in lbs. on :—													Total Gain in lbs.	Daily Gain in lbs.	Points Placed on Calves.			Purchase Price (plus Insurance) on 1st Sept., 1922	Cost of Food (excluding Pasturage)	Cost per pound gained in Live Weight during 12 months, in pence.	Particulars of Feeding and Prizes.
	Sep. 1	Oct. 1	Nov. 1	Dec. 1	Jan. 1	Feb. 1	Mar. 1	April 1	May 1	June 1	July 1	Aug. 1	Aug. 31			On 1st Sept., 1922.	On 31st Aug. 1923.	Total Points Gained				
																			£ s. d.	£ s. d.		
Steer	468	—	—	600	—	—	—	—	—	789	—	956	980	512	1·64	65	94	29	13 0 0	11 19 0	5·60	Out to Grass all the year. Feed—1095lbs. Linseed Cake and 1095lbs. Sharps.
Heifer	340	348	358	420	475	526	608	664	704	772	879	966	972	632	1·79	40	96	56	8 15 0	17 9 3	6·63	Loose Box all the year. Feed—880lbs. Linseed Cake, 267lbs. Crushed Oats, 1213lbs. Hay, 3483lbs. Roots and 1097lbs. Maize Meal. **First Prize.**
Heifer	478	478	—	486	490	532	—	—	—	720	—	—	936	456	1·61	46	70	24	10 10 0	9 6 10	4·92	Loose Box Winter, Grass Summer. Feed—789lbs. Linseed Cake, 353lbs. Crushed Oats, 363lbs. Bran, 713lbs. Roots and 362lbs. Hay.
Steer	444	483	560	632	647	724	756	801	846	836	906	938	950	502	1·71	55	66	11	11 10 0	7 1 8	3·37	Loose Box Winter, Grass Summer. Feed—487lbs. Linseed Cake, 425lbs. Maize Meal, 638lbs. Hay and 45 galls. Skim Milk.
Steer	392	441	497	542	578	616	—	—	—	672	721	792	880	488	1·54	62	73	11	12 10 0	1 19 3	·96	Yard in Winter, Grass Summer. Feed 453lbs. Hay and 906lbs. Roots.
Steer	420	—	—	576	—	—	—	—	—	741	—	928	988	568	1·77	57	76	19	11 15 0	11 18 10	5·05	Out to Grass all the year. Feed—1095lbs. Linseed Cake and 1095lbs. Sharps.
Steer	316	370	392	426	507	534	582	633	674	780	854	921	968	652	2·06	46	78	32	10 0 0	10 7 6	3·82	Loose Box Winter, Grass Summer. Feed—897lbs. Linseed Cake, 601lbs. Hay, 1228lbs. Roots and 502lbs. Crushed Oats. **Commended.**
*Steer	412	454	496	496	510	548	590	—	663	—	—	—	752	340	1·34	60	65	5	12 0 0	9 5 6	6·54	Loose Box Winter, Grass Summer. Feed—406lbs. Linseed Cake, 641lbs. Crushed Oats, 468lbs. Hay, 449lbs. Bran and 849lbs. Roots.
Heifer	358	—	—	511	—	—	—	—	—	655	—	830	856	498	1·49	40	80	40	8 15 0	11 19 4	5·77	Out to Grass all the Year. Feed—1095lbs. Linseed Cake and 1095lbs. Sharps. **Reserve and Very Highly Commended.**
Steer	450	530	577	625	676	719	782	890	921	1036	1124	1155	1169	683	2·09	52	100	48	11 5 0	17 9 3	5·83	Loose Box all the Year. Feed—880lbs. Linseed Cake, 267lbs. Crushed Oats, 1213lbs. Hay, 3483lbs. Roots, and 1097lbs. Maize Meal. **Second Prize.**
Heifer	332	338	370	409	—	—	562	588	684	714	—	877	884	552	1·70	40	85	45	10 5 0	8 13 5	3·77	Loose Box Winter, Grass Summer. Feed—513lbs. Linseed Cake, 195lbs. Crushed Oats, 1429lbs. Hay, 1262lbs. Roots and 61lbs. Bean Meal. **Third Prize.**
Heifer	332	341	350	366	406	—	—	—	—	463	—	600	648	376	1·23	40	68	28	10 5 0	3 14 3	3·82	Out to Grass all the Year. Feed—24¢lbs. Linseed Cake, 242lbs. Crushed Oats and 362lbs. Hay.
Heifer	360	380	408	436	476	526	592	640	660	748	792	868	892	532	1·70	43	74	31	9 17 0	4 13 0	2·10	Loose Box Winter, Grass Summer. Feed—185lbs. Bibby's Cake, 361lbs. Crushed Oats, 602lbs. Hay and 543lbs. Roots.
Steer	336	324	334	342	366	401	401	—	480	548	608	677	768	432	1·29	40	67	27	12 7 0	9 11 6	5·32	Loose Box Winter, Grass Summer. Feed—582lbs. Linseed Cake, 668lbs. Hay, 382lbs. Bran, 182lbs. Crushed Oats and 380lbs. Dairy Meal.
Steer	264	329	354	395	—	—	473	516	619	658	—	832	856	564	1·72	53	75	22	12 7 0	8 13 9	3·69	Loose Box Winter, Grass Summer. Feed—513lbs. Linseed Cake, 195lbs. Crushed Oats, 1429lbs. Hay, 1262lbs. Roots and 61lbs. Bean Meal.
Heifer	—	—	440	476	544	538	—	—	—	704	—	—	840	384	1·65	56	90	34	11 10 0	8 16 0	5·50	Loose Box Winter, Grass Summer. Feed—737lbs. Linseed Cake, 331lbs. Crushed Oats, 316lbs. Bran, 713lbs. Roots and 362lbs. Hay. **Highly Commended.**

Average Daily Gain in Weight for all Calves—1·65lbs. Average Cost per pound gained in Live Weight during 12 months, in pence—4·48d. Average Gross Profit per Calf—£16 19s. 9d. Average Net Profit per Calf—£7 8s. 7½d. *This Calf got out of Yard and was lost for the last two months in the Woods, therefore losing Flesh and Condition.

THE "SUSSEX" BABY BEEF CLUB.

STATEMENT OF LIVE WEIGHTS, COSTS, PROFITS AND GAINS FOR THE YEAR ENDED 31ST AUGUST, 1924.

Sex of Calf.	Weight in lbs. on :—													Total Gain in lbs.	Average Daily Gain in lbs.	Points Placed on Calves.			Purchase Price (plus Insurance) on 1st Sept., 1923	Cost of Food (excluding Pasturage)	Cost per pound gained in Live Weight during 12 months, in pence.	Particulars of Feeding and Prizes.
	Sep. 1	Oct. 1	Nov. 1	Dec. 1	Jan. 1	Feb. 1	Mar. 1	April 1	May 1	June 1	July 1	Aug. 1	Aug. 26			On 1st Sept., 1923.	On 26th Aug. 1924.	Total Points Gained				
																			£ s. d.	£ s. d.		
Steer	212	278	—	345	406	474	546	604	678	738	801	862	924	712	2·00	41	100	59	10 14 0	8 2 11½	2·75	Loose Box all the year. Feed—406lbs. Thorley's Cake, 509lbs. Crushed Oats, 1707lbs. Hay, 1917lbs. Roots, 244lbs. Barley Meal. **First Prize.**
Steer	290	—	—	—	472	—	—	—	576	624	722	790	812	522	1·55	46	74	28	11 17 0	6 10 9½	3·01	Out to Grass 10 months, Loose Box 2 months. Feed—850lbs. Linseed Cake, 486lbs. Sharps, 234lbs. Crushed Oats, 240lbs. Hay.
Steer	232	288	351	384	456	518	530	630	686	710	810	891	868	636	1·87	42	64	22	10 19 0	7 15 6	2·93	Loose Box Winter, Grass Summer. Feed—518lbs. Bibby's Cake, 115lbs Crushed Oats, 235lbs. Maize Meal, 1860lbs. Hay, 53lbs. Bran, 1358lbs. Roots.
Heifer	279	327	—	412	466	502	570	639	688	742	777	824	882	603	1·88	48	84	36	12 7 0	8 2 11½	3·24	Loose Box all the year. Feed—406lbs. Thorley's Cake, 509lbs. Crushed Oats, 1707lbs. Hay, 1917lbs. Roots, 244lbs. Barley Meal.
Heifer	269	308	382	448	548	607	674	740	812	820	898	952	980	711	2·05	43	88	45	11 4 0	7 6 4½	2·47	Loose Box Winter, Grass Summer. Feed—777lbs. Linseed Cake, 531lbs. Crushed Oats, 839lbs. Hay, 1516lbs. Roots. **Third Prize.**
Steer	238	279	302	322	324	364	—	444	476	—	—	660	742	504	1·60	40	60	20	10 10 0	10 19 5	5·22	Loose Box all the year. Feed—2416lbs. Hay, 348lbs. Linseed Cake, 1057lbs. Crushed Oats, 451lbs. Bran, 1092lbs. Roots.
Steer	238	—	—	—	398	—	—	—	472	534	616	721	756	518	1·55	43	62	19	11 4 0	5 15 7	2·68	Out to Grass all the year. Feed—779lbs. Linseed Cake, 486lbs. Sharps, 122lbs. Crushed Oats.
Steer	269	303	399	432	490	560	570	671	751	752	814	827	860	591	1·80	42	70	28	10 19 0	7 16 10	3·18	Loose Box Winter, Grass Summer. Feed—518lbs. Bibby's Cake, 115lbs. Crushed Oats, 235lbs. Maize Meal, 1860lbs. Hay, 53lbs. Bran, 1358lbs. Roots.
Heifer	205	244	—	328	400	414	455	540	582	608	644	672	728	523	1·72	50	68	18	12 16 0	6 4 10½	2·87	Loose Box Winter, Grass Summer. Feed—972lbs. Bibby's Cake, 326lbs. Crushed Oats, 91lbs. Bran, 394lbs. Hay.
Steer	312	—	—	—	546	—	—	—	604	676	782	860	864	552	1·46	46	66	20	11 17 0	6 10 9½	2·85	Out to Grass 10 months, Loose Box 2 months. Feed—850lbs. Linseed Cake, 486lbs. Sharps, 234lbs. Crushed Oats, 240lbs. Hay.
Steer	217	273	287	363	386	455	509	619	633	716	756	812	844	627	1·99	50	78	28	12 16 0	8 9 11½	3·25	Loose Box all the year. Feed—879lbs. Bibby's Cake, 321lbs. Linseed Cake, 226lbs. Bibby's Meal, 108½lbs. Maize Meal, 108lbs. Bran, 174lbs. Roots, 997lbs. Hay.
Steer	—	—	—	361	430	495	582	—	—	—	—	981	1012	651	2·28	45	93	48	14 13 0	7 6 10	2·71	Loose Box all the year. Feed—431lbs. Linseed Cake, 300lbs. Crushed Oats, 1612lbs. Hay, 1366lbs. Mangold, 207lbs. Maize Meal, 147lbs. Cotton Cake, 147lbs. Bran. **Second Prize.**
Heifer	—	—	—	354	378	412	447	474	480	—	500	514	524	170	0·92	43	58	15	13 12 0	3 10 8½	5·00	Loose Box all the year. Feed—272lbs. Linseed Cake, 215lbs. Maize Gluten, 794lbs. Hay, 910lbs. Roots.
Heifer	—]	—	—	465	500	544	610	647	686	728	768	805	840	375	1·54	55	80	25	13 12 0	3 18 5	2·51	Loose Box Winter, Grass Summer. Feed—475lbs. Linseed Cake, 304lbs. Crushed Oats, 486lbs. Hay.

Average Daily Gain in Weight for all Calves—1·73lbs. **Average Cost per pound gained in Live Weight during 12 months, in pence—3·18d.** **Average Gross Profit per Calf—£22 14s. 7d.**
Average Net Profit per Calf—£17 3s. 2d.

This latter ration was not relished. Now, since the rations were the same except for the substitution of palm kernel meal for barley, since the starch equivalent of the former is 66 against 67.9 for barley, one would have thought that the result would have approximated more nearly. Both these results were economical for, as Professor Wood says, 4lb. of meal are generally required for 1lb. of increase in pigs.

In the nutrition of pigs, I do not suppose one person in ten pays any attention to the *kind* of fat which will be produced by his ration, but from a bacon curers point of view this is important. He classes the fat into four types.

A—dead white, firm, unobjectionable in odour and taste.

B—white, soft and oily, no other objectionable features.

C—white, soft and oily and rancid disagreeable odour, which becomes intensified with length of maturity.

D—yellow, soft and oily, tends to become racid.

Many foods contain more oil than is necessary and it appears that same is deposited in the adipose tissue without much change in composition and will thus retain its essential characters, *e.g.*, fish oil.

There are several varieties of oil in pig foods. (1) Drying oils—linseed, hempseed, soza bean, millet and sunflower. (2) Semi-drying—maize, cotton seed, lentil, wheat, rape, barley, rye and bean. (3) Non-drying—rice, peanut, palm kernel, cocoanut. (4) Marine animal oils—herring is drying, but most other common fish contain non-drying. A drying oil is one which goes gummy or like varnish.

Fattening Cattle.—Expensive protein nutrients need not be given to any extent, but the cheaper carbohydrates, feeding stuffs and fat do all that is necessary.

Professor Wood's method of rationing (Table 1 for rationing cattle is sound and does away with the old wasteful rough and ready methods. Fattening cattle is a science and really a treatise could be written on the subject. The rationing requirements in many cases would be complicated by the animals running out at grass and to be scientifically exact one would have to know the fattening powers of the particular pasture, be it good, average or poor, and the fraction of the ration which should be allocated to the work of walking about as they graze. These, however, can be estimated.

I am convinced that many farmers waste money by giving cakes rich in protein and oil to animals out at grass, when something like oats or other grain would supply all the needs. It is curious how some pastures, not very different to others as far as the naked eye is concerned, have a reputation for fattening. The Pevensey marshes near Eastbourne are those in my mind.

Feeding Working Horses.

Attempts have been made to measure the work done by horses in foot pounds and to ration him according to a very scientific formula, but as the work often varies from day to day according to the weather and other circumstances and as the *overfeeding* of this class of animal is sometimes attended with serious consequences, very much must be left to the discretion of the stable man. It seems futile to me to measure in figures the desired ration on the idea of a maintenance and production portion and I believe in sticking to the nitrogenous ratio and adjusting it to the needs of the case.

Armsby, in his *Nutrition of Farm Animals*, accepts Juntz and Hazemann's figures and states that for a horse weighing 1000lb. there is required a total of 11.9 as calories of metabolisable energy, made up of two portions (*a*) internal work; (*b*) heat production.

Linton (*Veterinary Journal*, April, 1917), basing his calculations on a study of former investigations and on the rations given in practices, suggests 13,000 calories to meet the demands of a 1000lb. horse. Kellner says that his starch values may be applied to horses and ruminants, whilst Armsby gives a higher value to some foods for the horse than he does for ruminants, hence conflicting results may be obtained according to whose figures we use. Kellner says that 6.6lbs. of starch will satisfy the demands of a resting horse weighing 1000lbs. and that this is contained in 16lbs. of "good" meadow hay. I presume the animal would not need quite so much of "very good" meadow hay, but if you will reckon out the difference in the calories of the two substances, you will find it is no less than 1,600 calories, which rests on the classification of the stableman according as he decides it is "good" or "very good." In the horse I think we had better leave all these confusing results regarding calories and energy value and adopt the nitrogenous ratio as our guide.

A nitrogenous ratio of, say, 1—6, reckoned on the digestible portions of the food, is advisable for a hard worked horse, and, say, 1—8 for animals doing moderate work.

A stud of cart horses numbering 1,500, belonging to a railway company and chiefly comprised of 13—14 cwt. horses (which have to trot on the London streets with anything from 30 cwt. to 2 tons), some 16.17 cwt. horses used for shunting purposes, and some small animals of the light parcel type, weighing 10—11 cwt., is maintained in good hard muscular condition on the following ration:—

Oats, fed whole	11lb.	10lb. 9lbs.
Maize, split	3lb.	
Hay, Clover } chop	10lb.	
	5lb.	(in long hay)
	29lb.	=N. Ratio 1—6 (fat×2½).

Water is supplied *ad lib.*

The Veterinary Surgeon in charge of the above (Mr. Norman Thompson) informs me that on that ration colic is "very rare."

In another stud a similar ration was used, but 3.4lbs. of straw were substituted for that amount of clover hay. The amount of indigestible fibre resulted in

colic being "fairly frequent" and the animals did not do so well on it.

The following experiment shows that the mere substitution of one food for another, the chemical compositions and starch equivalent being similar, does not always meet with success. A firm of brewers, whose horses I attended, suggested substituting some of their dried brewers' grains for part of the oat ration. There is a little more protein and a little less carbohydrate in grains, compared with oats, which should not have been an adverse factor. The starch value was 50 as against 60, which was taken into consideration in the weights. The horses would hardly eat the mixture and lost condition. Moreover, two valuable horses almost died of colic in the first week, so the experiment was not persisted in.

With respect to bran, our judgment has rather undergone a change within the last few years. Formerly it was thought that its *food value*, as distinct from its laxative effect, was very little, but now we think it has a fair food value for the horse, though I am inclined to think 45 does not express its practical worth. Its value may lie in some substance of a stimulating kind in the aleurone layer.

With respect to maize, it is not suitable for horses doing fast work, hunters and race horses.

Rations for Sheep. Nothing need be added to the remarks in the paper.

In conclusion, let me say that it has given me great pleasure to string these few platitudes together on a subject which ought to command greater interest than it does from the ordinary practitioner.

What I like about the paper is its sound and concise exposition of such a complicated subject, combining, as it does, the scientific with the practical to a high degree. I hope the discussion may bring forward something of profit to help in the elucidation of the problem.

Mr. J. W. McIntosh: I should like, in the first place, to express my thanks to Professor Wood for his most interesting and instructive remarks on this important subject. I have very little to say on the subject in its general bearing, but as one who has given some attention to the feeding of horses, I should like to speak briefly to this aspect of it.

I regret that Professor Wood has not given us a little more information with regard to the feeding of horses, because for myself and for others who are responsible for the management of large studs of horses, this is the most important matter of all. The feeding of breeding animals and of growing animals and the fattening of animals is pretty much a matter of scientific knowledge and follows certain definite lines, but when you come to consider the feeding of horses, and especially those animals engaged in transport work, the subject is somewhat difficult and complicated.

When you consider the conditions under which such animals work, then the question of getting a diet to meet the varying requirements thereby created is one of very great economic importance. I am not aware that any real and valuable test has been carried out in this country on the feeding of transport horses. A great deal of scientific work has been done in connection with the feeding of animals, particularly of farm animals, but this branch of feeding has been, I think, woefully neglected.

At a time like this, when motors are displacing the horse, I think if something was done by scientific workers in connection with that important branch, it would do a great deal of good in maintaining the horse on the streets of London and our other large commercial cities. It would, for instance, be of the greatest value to us to know what effect the nitrogenous ratio has upon the digestive organs. We are supplying to horses in very hard work a mixture the nitrogenous ratio of which is very high, but the effect on the animal's digestive powers must be considered and there is a maximum beyond which we dare not go.

I think Mr. Taylor said that he did not feed maize to horses doing fast work. I would say that you can maintain an excellent condition in fast and in slow work without using a single grain of oats, and we maintain—and I say this with all modesty—a high standard of efficiency and a remarkable freedom from digestive disturbances. We use a considerable amount of dried grains and we get very good results as we are careful to maintain a properly balanced ration.

I desire to express my own personal thanks to Professor Wood for so kindly bringing this matter before us.

Mr. W. H. Brooke: I should like to thank Profesosr Wood for his very enlightening paper and Mr. Taylor for his very valuable supplement to it, though I am afraid that the latter's statement of statistics is of very little use to a body of men that cannot hear very much (laughter), and it would have been much better if they had been put in tabular form and circulated a few minutes before the address.

With regard to the feeding of herbivora on carnivorous meal, during the time we had influenza, we thought that meat in meal, given like balls, would be essential, but I never saw any good results. I think that carnivorous meal given to a herbivorous animal is likely to upset the metabolic balance and do very little good, if not actual harm. Mr. Taylor told us how the bones fed to animals in South Africa are assimilated, but I am inclined to think that a great disproportion in calcium assimilation would result.

Mr. D. S. Rabagliati: I should like to add my quota of appreciation to Professor Wood for his excellent paper. Does Professor Wood think that the composition of different food stuffs differs in different countries? In Egypt the staple bulk food is what is known as tibn—it consists largely of wheat straw. I have seen native horses in condition put on to a maintenance diet of practically nothing but this, and they will remain in excellent condition. The nitrogenous ratio is, I think, 1—330 and I do not quite understand why the nitrogenous ratio of wheat straw should be so very much lower than that of oat straw, which I believe, to be 1—100. Naturally,

however, when the animals work their condition would melt away to nothing if they did not get anything else.

Does Professor Wood think that the composition differs in different countries, or that it is due to the animals getting used to it after hundreds or thousands of years of its consumption by their kind ?

During the war, horses brought to Egypt received nothing but wheat straw and barley. Here we say that it is unsuitable to feed barley, but it was remarkable how well the animals did there. Two of the speakers also mentioned maize as being unsuitable to fast horses. In Egypt the race horses are fed entirely upon barley and straw, when they are brought into the pink of condition.

Mr. Eaton Jones said that, like Mr. McIntosh, he deplored the fact that there was so little in the paper about the feeding of horses and particularly of working horses. It is, he said, a very trying economic problem and in these days of motors it would often help to have something upon definite lines upon which to go in order that the horse may be maintained upon the streets at the lowest possible cost. I have found that feeding cart horses in work out of a book is a mistaken policy. Each horse, in my opinion, whatever its work, requires to be fed according to its own idiosyncrasy. There is also a great deal in the way in which the food is prepared, but we have got very little information about that in these various rations. In my experience, oats, barley and maize are all of about equal feeding value, no matter what the starch equivalent may be. The work of Mr. Charles Hunting, of Durham, is very valuable in that respect. He used to feed his horses 16lbs. (daily) of a mixture of maize, oats and barley, and I believe he fed always dry. The Liverpool Corporation horses are maintained mostly on oats, maize, beans and dried grains. Our oats are always steeped in cold water for twelve hours—that saves a lot. They get 16lbs. cereals and 10lbs. hay, the horses in very hard work getting a few beans. When we had a stud of 6,000 tram horses we fed absolutely on 16lbs. maize per day, and they did very well. Bran, I find from experience, is not of any use in maintaining condition ; it is useful as a laxative and that is about all.

Mr. Hugh Begg : In the year 1917, as some of you may remember, there was a very short spring and the change from Winter to Summer was remarkably rapid ; indeed, it was about the 10th of May before the Scots people got their cattle put out. Within a period of seven or eight days in that year we had hundreds of deaths in Ayrshire cattle when, the sudden change of weather having taken place, a phenomenal growth of grass occurred. I want to tell you how that type of auto-intoxication took place over such a large area of Lanarkshire and the neighbouring counties. I can inform you of cases occurring in that week where cattle grazing out in the winter time were taken down into the meadows and died suddenly of " staggers," and the milk fever type of animal was the type most subject to these attacks. Sir Stewart Stockman was quite convinced that it was due to some poison in the grass, but I did not agree at all.

We have always a multiplication of deaths at that time of the year, and the year in question was a most disappointing one. To my mind, there is no doubt whatever that the cause of the trouble was auto-intoxication, due to the liberation of poisonous products in what one would have said was normally a perfectly good food.

Mr. W. K. Barron : This subject of dietetics is a very important one, and Mr. Begg's remarks with regard to the auto-intoxication of calves, have reminded me that in the autumn, after a dry summer, we have very few cases of milk fever. I think that milk fever, in its origin, is dietetic.

Mr. J. D. Whitehead : I should like to say a few words in connection with the feeding of dairy cattle. Professor Wood, in his paper, emphasises the necessity for the supply of protein to cows in milk. I think it is an important point, because on several occasions the analyst has found the milk deficient in fat and has followed it up to the farm of origin, and in practically every case we have been able to remedy the cases where the milk was below the legal standard by increasing the nitrogenous ratio of the food. We have found that by increasing the nitrogenous ratio the fat constituent has been increased. Years ago I was told that you could not influence the quality of milk by feeding, but only the quantity. We have proved definitely that you can influence the quality. Many farmers have been very shy of increasing the protein because they say it sends the cows wrong in their feet and I think that is correct. I should, therefore, like to know what is the safe amount of protein which can be given.

Mr. W. Brown (Aberdeen) : This subject is one which should arouse much more interest than it does at present. We all recognise the importance of the bacteriologist, but at the same time many of us realise that a sound system of nutrition is one of the most important means of warding off disease. I am very glad that Professor Wood has brought the subject up, only I should have liked him to elaborate it a little more. You know how in recent years breeders have been operating upon the milk record pedigree system. They have raised quality and quantity in every way. I think it is one of the duties of the veterinary surgeon to teach his client about the feeding of dairy cows. The man who expects to get five gallons of milk on a maintenance ration is an optimist. I think we should give this matter greater attention, because we are expected to advise our clients in matters of feeding.

There is an old saying that whilst bran yields a very good analysis as far as food for the horse is concerned, he cannot derive the value from it. I should like to know what Professor Wood has done in the way of experimentation to ascertain whether a horse can fully digest bran.

I am rather astonished to hear Mr. Whitehead say that the quality of milk can be altered in the feeding. We now believe, I think, that the quality of milk and the constituents of milk are largely a question of

heredity—a cow was born to give 3·5 per cent. of fat in the milk. You can, of course, alter the quantity.

Major REES-MOGG, after associating with the previous speakers in thanks to the essayist, said: I, too, am sorry that in a paper of 11 pages Professor Wood has only given us eighteen lines about the horse. Mr. Eaton Jones said he always steeped the corn—I would like to know what is his idea, and how many times a day he feeds his horses. Mr. McIntosh says he never gives a pound of oats. I never gave that to my horses in India; I used to play polo regularly with ponies fed on maize and I do not know why Mr. Taylor says that they cannot do fast work on it. I certainly think that animals are subject to certain diseases from feeding on certain things, and I should like to ask if Matbar is a good food for horses—it is being taken up a lot by cavalry leaders, and is a dried grain.

Mr. H. G. BOWES: I should like to speak of the importance of a balanced ration in feeding. I think a great deal of importance should be attached to the management and the method of feeding, and how often a day it takes place, particularly in regard to cattle. Another point with which Professor Wood has not dealt, but which is of great interest to us as veterinary surgeons, is the effect of improper feeding on the health of animals and the production of disease. I think there is no doubt that many of the ailments of farm stock are due to the improperly balanced rations. I was very interested to hear Mr. Begg in reference to the disastrous happenings to cattle in Scotland some time since. I have seen the same thing in a modified form in Yorkshire some four or five years ago. The animals, within a week or two of being turned out to pasture, which was very flush after some rain, developed a disease which can best be described as being indistinguishable from milk fever, but which had no relation to calving. My own view was that of Mr. Begg's—that the disease is a form of auto-intoxication due to some effects set up in the digestive system. There is a great deal of room for investigation into diseases of that kind.

Mr. MCINTOSH here rose to say, in reply to Major Rees-Mogg, that he did not state that he had never used oats, which was a safe constituent of a well-balanced diet for horses, but that on economic grounds a good diet could be given without them.

THE REPLY.

Professor WOOD, in reply to the discussion, said: I feel tremendously complimented that the paper I had the pleasure of writing for you has produced such a lengthy discussion. I must not attempt, however—as there is not time to do so—to reply to all the points which have been raised. Also, to many of the points I have no answer to give. In writing this paper the idea I had before me was this: As I pointed out in the introduction to my paper, something like a hundred years ago—when science had advanced to the stage which enabled it to tackle the problem of the nutrition of animals—it tackled them in rather a crude way, as always happens when things begin; and the information that science provided at that time was—as, I am sorry to say, it still is—very, very incomplete. There was one agency for spreading what knowledge there was, and that was the agency of the landlords of 100 years ago, or rather more. The unfortunate part about it was that the knowledge spread at that time was in many cases very inaccurate. The result was that the people who started out to investigate the nutrition of animals often jumped to wrong conclusions, which are still the basis of our practice all over the country. These conclusions are responsible for the chief errors in the feeding of animals which, in my opinion, are still prevalent. To put the thing in a nut-shell, I think the chief mistakes in feeding are these: That we have fed too much protein to our working animals and our fattening animals and far too little to our milking animals and our growing animals. I think the reason for that is that when people first of all began to analyse and to study nutritional problems, the first thing they did was to find that the muscles of working animals consisted of albuminoids, and they jumped to the conclusion that if you wanted to fit a working animal to do more work, the animal had to eat more protein and therefore you must give it. Directly the physiologists got to work on the problem they found that that conclusion was wrong. They found that the muscles were simply the connecting rods that did the work and that they did the work, not by the expenditure of their own substance, but at the expense of the carbohydrates, and that it is only if you do not give enough starch and sugar that the animal starts to use its own substance. We want to see that the animal can get the extra total amount of food inside him to provide the motive power for the work he has to do, and that means cutting down the protein in order that the animal may have room for the carbo-hydrate material. But that does not mean that there is no need to give a hard-working animal an extra quantity of protein matter. The important thing about heavy work and production generally is that the animal can only get a certain amount of food inside the capacity of his body, and you have got to give the sort of food that has a high nutritive value.

Let me ask how it is that modern knowledge has not been spread—because many of these things were found out by Kellner thirty or forty years ago. The reason is, I think that these discoveries happened to synchronise with the existing depression of agriculture in this country in the later seventies. Throughout the time of depression the landlords were unable to carry on the work of knowledge distribution they had accomplished before and, if they had been able to do so, the farmers were not in the frame of mind to put the new ideas into practice, as they had not the money. So that from 1870 to 1900 knowledge was not being spread through the country because the agricultural industry was not in the frame of mind to receive it. But we are now again beginning to have an agency for the spread of knowledge. He is the agricultural organiser, and I hope, gentlemen, that you yourselves will form another channel.

It was in order to put before you my view of the trend of the advancement of knowledge of animal nutrition that I undertook—and was very glad of the opportunity—to write a paper for you. I knew it was no use trying to write a very long paper, as I did not think that people connected with agriculture were very good readers of long papers. I therefore gave you, I am afraid, only one aspect of the thing and that I thought could best be done by means of short and succinct tables whereby you might be enabled to check a farmer's ration. As to the different points raised, I have got here a whole batch of them, and if I try to answer all of them I shall, first, get myself into a fog, secondly, get you in a fog, and thirdly, cut short the discussion on the paper which is to follow.

But the first question was about proteins. I do not think there is any doubt that it is a very useful thing for the proteins of any ration to be derived from different sources, because the proteins differ very markedly from one another in their composition. Do not feed an animal on cereal proteins only—give him some other proteins and the chances are that the other proteins you give him will contain more of the constituent you find to be essential than the one. I was rather reproached because I have not said much about vitamines. I am only going to say that I think the word vitamine is such a romantic-sounding one that it has got hold of the attention of the people of this country to a much greater extent that its importance in agriculture deserves. If you feed your animal on an adequate mixed ration, including a fair amount of green stuff, I do not think you need have any fear that your animal is going to take any harm for lack of vitamines. If any of you have the good fortune to experiment on vitamines, if you try to get a vitamine-free diet you will come to the conclusion that in order to get a diet so deficient in vitamines that it is going to do the animal any harm you have got to take a great deal of trouble and exercise a great deal of skill—far more trouble and skill than the average farmer can either exert or command.

I was asked why I did not give rations for calves and for young animals generally. You will find it stated, in my summary of the paper, that the maintenance ration of an animal is related to its live weight by a perfectly definite law. In the case of the pig we know from actual experience and observation what the maintenance requirement of the young animal really is. We hope to make direct observations on the other animals in time and that is why I have not given rations for young animals, as I do not know what the maintenance requirements of young animals really are except in the case of the pig. Concerning the question of a higher albuminoid ratio for the heavy animal than for the animal doing light work, I do not see any reason why it should be very much higher, although the heavy working animal requires a little more protein to make its digestive juices. People who use albuminoid ratios forget the fact that albuminoid ratio is a ratio and not a single figure. The ratio is a fraction and it wants a certain amount of mathematical skill to manipulate it. The result is that through my paper I have given what I consider to be a better thing, *viz.*, the actual weight of protein which is required per day by animals of given weight. I have given up bothering about albuminoid ratio and have gone for the actual quantity of albumen they want to eat in a day.

Somebody asked about the effect of temperature on the pig in relation to the fact that I give the requirements of the pig in terms of calories. The effect is very great indeed, but it does not work out to be much in actual practice, because there is so much spare heat in the ordinary rations you give a pig that the animal can use that for maintaining his body temperature without making any extra call for oxidation to keep up his body temperature. You can take it, however, that 1000 calories means 1lb. of meal.

The reason I do not give more information about the horse is the very good one that I do not possess it. The horse is not an animal with which I have ever done any experimental work. The figures I gave about the horse are the most modern figures I was able to find in the literature of animal nutrition and I fear I cannot supplement them in any substantial way. The answer to the question concerning the feeding of herbivorous animals on carnivorous meals is contained in the remarks I made about the mixing of proteins. On the whole, the proteins of animal origin are nearer in composition to the protein mixture required by any animal than the proteins of vegetable origin. I cannot say that there is any *prima facie* reason why animal proteins should disagree with an herbivorous animal—indeed, I think they should be advantageous.

Another set of questions related to crops grown in different countries. It occurs to me that there may be two possible answers. Allied to that question was another as to why oat straw was better than wheat straw. The answer is that we generally get oat straw before it is ripe, and wheat, especially in the South, we are inclined to let stand until it is ripe. The process of ripening consists in the migration of the digestible material from the roots and straw into the grain and if we are getting it before it is ripe the location of the digestible matter is not complete. To continue the answer, the varieties grown in other countries may not be the same as the varieties grown in this country.

There are many other interesting points, but we are half-an-hour late already and I will therefore conclude now by thanking you very much indeed for the opportunity to read this paper to you and by congratulating myself heartily on the interest that it has aroused, as evidenced by the lengthy discussion and by thanking you again for listening to my explanations.

The President (Mr. Gofton) expressed the very hearty thanks of the Association to Professor Wood for his paper and reply to the discussion upon it.

The Veterinary Record.

12th September, 1925.

REPORT OF THE FOOT-AND-MOUTH DISEASE RESEARCH COMMITTEE.

By all members of a profession specially interested in the elucidation of the causation of animal diseases, and concerned in measures for their effective control, the First Progress Report of the Foot-and-mouth Disease Research Committee, now available for purchase at any of H.M. Stationery Offices, will receive a warm welcome. Appreciation at its publication is all the more pronounced in view of the fact that the causative agent of the disease in question was reputed to have been discovered in April of last year by Frosch and Dahmen, two German scientists, by a process of micro-photography, who claimed also that they had succeeded in cultivating it outside the body in tubes for as many as twenty-five generations of culture, and who even went so far as to apply the designation of *Löffleria Nevermanii* to it. Coming at a time when this country was engulfed in a very severe visitation of the disease, great expectations were associated with the reputed discovery, and hopes were entertained that this insidious foe, which for so long had baffled the scientific mind, was within measurable distance of being successfully, easily, and economically mastered.

The first duty of the Committee on appointment, therefore, was to search for the virus, following the suggestions of Frosch and Dahmen, who openly showed their methods to the Committee's research workers and to other scientists of this country. Alas for the discovery of Frosch and Dahmen! The elusive causative agent of foot-and-mouth disease still holds the field. Briefly, it may be stated that, apart from one or two uncertain results, the Committee, after carefully repeating the work of Frosch and Dahmen with all known precautions, and with many variations, have been unable to confirm their findings, not only with regard to the actual separation of the organism, but to its culture and sub-culture. Investigations on these initial, basic, and essential etiological factors of the disease were carried out at the Lister Institute of Preventive Medicine, London, and at the Ministry of Agriculture Laboratory, New Haw, near Weybridge. The "uncertain results" previously mentioned were experienced at the Ministry's laboratory, but repetition of the experiments was unproductive of similar results, and the Committee are conscious that the former results cannot be regarded as definitive. The experiences of Gins and other workers on the Continent also support the Committee's findings.

The caprice of Frosch and Dahmen's results having been studied, the Committee then concentrated their efforts on the qualities of the virus as it occurs in filtered fluids from the disease, its viability under varying conditions of temperature, changes in the reaction of the fluid in which it is suspended, the resistance of such agents as alcohol, chloroform, ether, antiformin, phenol, the action of glycerol, the effect of drying, etc., and a considerable amount of valuable and instructive information has been recorded tending to explanations in epizootic behaviour, and increasing our store of knowledge necessary for measures of control. For instance, the ability of the virus to maintain virulence in the cold room temperatures of 4° to 7° C. (39.2° to 44.6° F.) for over 190 days, and for over 124 days in an ice box at —4° to +3° C. (24.8° to 37.4° F.)—the virulent fluid being frozen and thawed at least twenty times—is quite in keeping with the prevalence of the disease in the cold season. Conversely, the rapidity of the disappearance of infectivity would appear to bear relation to temperature increases, being considerably more rapid at body temperature than at room temperatures and disappearing very rapidly from the blood on the onset of generalised symptoms of the disease, including the high temperature of fever. Drying experiments showed that in vesical fluid diluted and then dried the virus will remain active for seven days at 37° C. (human body temperature), and for at least fourteen days at 18° C. (64.4° F., or ordinary room temperature). The behaviour of the virus towards alcohol and chloroform is most extraordinary and, as the report says, with the exception of the so-called "mosaic disease" of certain plants, is without parallel in the literature of filter passers. It can withstand the action of 60 per cent. ethylic alcohol for eighteen hours at room temperature, while *Bacillus coli* and staphylococci were killed in one minute. In a saturated solution of chloroform it was found to survive for forty-one hours. It was not rendered inert by immersion in ether for three hours nor was infectivity destroyed by ether vapour in thirty-six hours. Truly the virus is remarkable, and the marshalling of such facts as briefly mentioned above must be of fundamental importance in the problems surrounding cultivation.

A second part of the Committee's work was a detailed study of the disease as it appeared in rodents artificially inoculated—a course deemed necessary, not only to confirm the now established fact that true foot-and-mouth disease can be experimentally induced in guinea pigs, but because it was felt that before embarking on expensive experiments on large domestic stock, investigation should first proceed in the small laboratory animals. The researches at

both the Ministry's laboratory and the Lister Institute have shown that the lesions in the guinea pig are specific, that no deterioration of virus has been experienced in its passage from one guinea pig to another, and that virus No. 1 (an English strain obtained from an outbreak in March, 1924) after passage through guinea pigs for over a year, has reproduced typical foot-and-mouth disease in cattle. The detail of the experiments carried out in these small animals is intensely interesting, and there can be no question as to their suitability for the purpose. As has been proved up to the present, no danger of spread of the disease by these small animals either under laboratory or field conditions—results. It has been found impossible to infect them by feeding on infective material, and attempts to cause a natural spread of the disease among them appear to have proved abortive. It is also interesting to observe that while the disease can be induced in rats and mice (field mice with great regularity) by inoculation, no natural transmission from rat to rat, mouse to mouse, or from mouse to guinea pig could be obtained.

Altogether, the Committee and all research workers are to be congratulated on their first Report and we, as a profession, look forward to an account of their future and more extended undertakings. With such a strong Committee to initiate, direct and control this particular investigation, added to the facilities which now exist at the Pirbright Experimental Station and the various research institutes, including the new Institutes of Animal Pathology, there is every reason to hope that complete success will crown the efforts so well begun, and that the aim of the Ministry of Agriculture will be achieved, viz., " that means will be discovered whereby the invasions of foot-and-mouth disease may be rendered less harmful to agriculture." In the part to be played towards this end, the profession looks specially to its own members. With the march of time it desires to see them more and more in the forefront of research into diseases of which they have special cognizance, in a field in which they are particularly called to labour, and where the honour attaching to scientific discovery leading to professional progress becomes appropriate. Hitherto we have been closely associated with the sister profession in the investigation of disease, and for real effective effort in research the association of the human and comparative training is not only taking up a strong position for general attack, but it would appear to suggest the advisability of the dual qualification. Be that as it may, it goes without saying that in every instance of enquiry and investigation into the causation of animal diseases, and the adoption of fitting measures for their control, the Veterinary Profession is anxious for the fullest representation and prominence.

When the carcass of a three-year-old heifer, found dead in a field at Child Okeford, Dorset, was opened, an adder 18in. long was found in the stomach.

Royal Sanitary Institute Congress.

Veterinary Inspectors' Conference at Edinburgh.

What was described by a veterinary inspector as the most successful Veterinary Conference he had ever attended was held in conjunction with the thirty-sixth Annual Congress of the Royal Sanitary Institute, at Edinburgh, on July 23rd and 24th. Lieut.-Col. Gerald Leighton, O.B.E., M.D., D.Sc., occupied the presidential chair of the Section, and the following is a list of some of the other delegates present :

W. Anderson, M.R.C.V.S., Pittenweem, Fife ; R. G. Anderson, O.B.E., F.R.C.V.S., T.D., Cupar, Fife ; J. Andrew, M.R.C.V.S., Paisley ; Councillor A. Arneil, Stirlingshire C.C. ; William Asher, Perth ; Deputy S. Alderton, late Chairman Sanitary Committee, Corporation of London ; Lieut.-Col. H. W. Brittlebank, C.M.G., M.R.C.V.S., D.V.S.M. (Vict.), Manchester ; W. Brown, B.Sc., M.R.C.V.S., Aberdeen ; John Brown, M.R.C.V.S., D.V.S.M. (Vict.), Perth ; E. J. Burndred, M.C., D.V.H., M.R.C.V.S., Blackburn ; Councillor J. Fardsly, Chairman, Health Committee, Denton U.D.C. ; F. H. Brundle, Chairman, Cattle Markets Committee, Corporation of London ; P. Stanley Blaker, M.R.C.P., D.P.H. (M.O.H.), Medical Officer of Health, Dudley, Worcester ; Councillor W. Bancroft, Sheffield ; W. B. Barclay, L.R.C.P., D.P.H. (M.O.H.), Weymouth ; Councillor W. H. Bolton, J.P., Vice-Chairman, Health Committee, Oldham ; T. W. Naylor Barlow, O.B.E., M.R.C.S., D.P.H. (M.O.H.), Wallasey ; J. C. Beckitt, M.R.C.S. (M.O.H.), Leigh ; A. Brindley, M.D., D.P.H. (M.O.H.), Derby ; Alderman M. Byrne, Chairman, Sanitary Committee, Birkenhead ; Councillor G. Beaumont, Vice-Chairman, Health Committee, Huddersfield ; Thomas Bishop, Edinburgh ; A. Lawrie Brown, Glasgow ; M. Benson, Wallasey ; Hugh Begg, F.R.C.V.S., Hamilton, Lanark ; Alderman T. Clarkson, J.P., Chairman Health Committee, West Hartlepool ; Alderman H. J. Cloake, Chairman, Public Health Committee, Chatham; Thomas B. Crookes, Scottish Board of Health, Edinburgh ; A. D. Campbell, M.D., D.P.H. (Deputy M.O.H.), Fife ; R. Veitch Clark, M.B., D.P.H. (M.O.H.), Manchester ; Surgeon-Commander L. F. Cope, R.N., Naval Health Officer, Rosyth ; Councillor E. Corby, J.P., Deputy Chairman, Health Committee, Salford ; F. G. Cobbett, Banbury ; J. H. Clark, Chiswick ; J. Donaldson, M.R.C.V.S., West Kilbride, Ayr ; John F. Dixon, M.R.C.V.S., Prestwich, Manchester ; A. Douglas, M.R.C.V.S., D.V.S.M. (Vict.), Ayr ; P. A. Dormer, M.A., M.D., D.P.H. (M.O.H.), Jarrow-on-Tyne ; Councillor J. Dicks, Chairman, Sanitary Committee, Llantrisant, Llantwit, Fader ; T. Evans, M.B., D.P.H. (M.O.H.), Swansea ; Councillor J. Edmondson, Chairman, Health Committee, Morecambe ; C. S. Elphick, M.R.C.V.S., Newcastle-on-Tyne ; Councillor C. F. Frances, Chairman, Sanitary Sub-Committee, Liverpool ; Duncan Forbes, M.B.E., M.D., D.P.H. (M.O.H.), Brighton ; A. Gofton, F.R.C.V.S., Edinburgh ; Councillor G. Gloag, Convener, Public Health Committee, Grangemouth ; Councillor R. W. Gibson, Chairman, Health Committee, Nelson ;

Councillor A. Green, Camberwell; G. Howie, M.R.C.V.S., Aberdeen; W. J. Howarth, C.B.E., M.D., D.P.H. (M.O.H.), City of London; Bailie A. M. Hunter, Convener, Public Health Committee, Ayr; Councillor W. J. Harvey, Convener, Public Health Committee, Edinburgh; J. T. Howarth, representing Novia Scotia; E. H. R. Harris, Birmingham; John E. Heath, Gravesend; J. D. Ingram, M.D., D.P.H. (M.O.H.), Crewe; David Jones, Convener, Public Health Committee, Kilmarnock; R. H. H. Jolly, M.D., D.P.H. (M.O.H.), Wolverhampton; Alderman W. T. Jackson, Chairman, Public Health Committee, Manchester; Councillor Mary L. K. Jones, Manchester; R. D. V. King, M.R.C.S., D.P.H. (M.O.H.), Ilkeston; Prof. H. Kerr, O.B.E., M.D., D.P.H. (M.O.H.), Newcastle-on-Tyne; J. McKinna, F.R.C.V.S., Huddersfield; J. S. Lloyd, F.R.C.V.S., D.V.S.M. (Vict.), Sheffield; William Leuw, Chairman, Sanitary Committee, Corporation of London; Gordon Lilico, M.B., D.P.H. (M.O.H.), West Hartlepool; James McCall, M.B., M.R.C.V.S., London; Prof. J. McAllan, M.A., B.Sc., M.R.C.V.S., Aberdeen; J. Gillray McGregor, M.R.C.V.S., Hamilton, Lanark; Councillor J. Maggs, Chairman, Health Committee, Bristol; J. T. Macnab, M.A., M.B., D.P.H. (M.O.H.), Stafford; Charles A. Mason, M.D., D.P.H. (M.O.H.); Cockermouth R.D.C.; Alderman W. Muirhead, Chairman, Health Committee, Liverpool; F. W. Medlock, M.R.C.V.S., Dumfries; R. G. Markham, M.B., D.P.H. (M.O.H.), Nelson; J. Moore, Southport; F. Mortimer, Nuneaton; Alderman W. Phene Neal, Cattle Markets Committee, Corporation of London; W. Ness, Edinburgh; James Orr, L.R.C.P., D.P.H. (M.O.H.), Barrow-in-Furness; Thomas Parker, F.R.C.V.S., Newcastle-on-Tyne; G. H. Pearce (M.O.H.), Heckmondwike U.D.C.; Frank J. Pullan, Corporation of London; R. Proudfood, M.D., D.P.H. (M.O.H.), Macclesfield R.D.C.; L. W. Pole, M.B., D.P.H. (M.O.H.), Llanelly; Councillor E. A. Roberts, Chairman, Road and Improvement Committee, Birkenhead; James J. Paterson, M.D., D.P.H. (M.O.H.), East Bucks; Alderman W. L. Robertson, Chairman, Health Committee, South Shields; T. Robinson, M.R.C.S., D.P.H. (M.O.H.), Leicestershire C.C.; K. Simpson, M.D., D.P.H. (M.O.H.), Barking Town U.D.C.; P. H. Stirk, M.R.C.S., D.P.H. (M.O.H.), Exeter; Councillor J. W. Thorley, Chairman, Sanitary Committee, Hindley U.D.C.; Councillor J. W. Brownhill Smith, Glasgow; E. J. H. Sewell, M.R.C.V.S., Edinburgh; Councillor S. C. Thompson, Chairman, Health Committee, Brighton; William K. Townson, M.R.C.V.S., Peterborough; A. M. Trotter, M.R.C.V.S., Glasgow; W. M. Willoughby, B.A., M.D., D.P.H. (M.O.H.), Port of London; J. D. Whitehead, F.R.C.V.S., D.V.S.M. (Vict.), Salford; Councillor A. Whittle, Leicester; Councillor J. Woolley, Chairman, Health and Child Maternity Welfare Committee, Ilkeston; C. G. Welsh, M.D., D.P.H. (Deputy M.O.H.), Bedfordshire C.C.; F. T. H. Wood, O.B.E., M.D., D.P.H. (M.O.H.), Bootle; Councillor T. Wrigley, Chairman, Health Committee, Oldham; J. B. Wilkinson, M.D., D.P.H. (M.O.H.), Oldham; W. F. J. Whitley (M.O.H.), Northumberland; Dr. Stenhouse Williams, Reading; C. Ward, Newcastle-on-Tyne; Lieut.-Col. T. D. Young, O.B.E., M.R.C.V.S., D.V.S.M., London; and James R. Hayhurst, M.R.C.V.S., D.V.S.M. (Vict.), Superintendent and Chief Veterinary Inspector, Metropolitan Cattle Market, Islington, who officiated as Recording Secretary; Messrs. J. Howard Jones and E. J. H. Sewell were the local Secretaries.

President's Address.

Dr. Gerald Leighton, presenting his address from the chair, said: The remarks I propose to make to-day will be very brief, for a reason which I think will commend itself to all of you. The subjects of the papers which are to be read to this conference are of such great interest and importance, in view of the coming into operation of new legislation, that all the time at our disposal will doubtless be required for full discussion.

When the Council of the Royal Sanitary Institute did me the honour of inviting me to preside over this Conference in Edinburgh, proud as I was of the honour, I felt considerable diffidence in accepting it. The reason I had that feeling was that I thought it might well be considered by some that the position was one which should be occupied by a veterinary surgeon, and I am not a veterinary surgeon. I placed that view before the Council who, however, pressed me to accept the position. But, though not a member of the veterinary profession, I have been very closely associated with it for more than twenty years. For ten of those years I was a teacher at the Royal (Dick) Veterinary College, and since then my official work has brought me continuously into contact with the profession. Indeed so much has this been the case that, as most of you will be aware, I have very decided views upon the kind of work which veterinary surgeons should do in public health, and the place the profession should occupy in our public health service.

The profession has, of course, been prominently associated for a long time with the activities of the Ministry of Agriculture in connection with diseases of living animals. But it has seemed to me that there is a very definite place for them in the public health administration in relation to food, and it is only recently that this has begun to receive recognition. You will find this view reflected in the Public Health (Meat) Regulations (Scotland) 1924, and very markedly also in the Milk and Dairies (Scotland) Act which comes into operation on September 1st of this year. The one law deals with meat inspection and the other with the supply, distribution, and inspection of milk; and in both these spheres, in my view, the veterinary inspector has a most important place to fill.

But what I want most to say to this Conference to-day is that at last we seem to be on the way to reaching the proper allocation of the duties of the doctor and the veterinary surgeon in public health work. I view with immense satisfaction this closer alliance of the two in one common aim and duty—the protection of the national health. I believe it is all to the good, both of the public and the officials. Ere long it is to be hoped that a further step will be taken by the central departments of health administration by the appointment of veterinary surgeons who will take their share in the supervision of food administration. Other countries have long reached

this position, and it cannot be very long delayed here. When that occurs I venture to say we shall have an astonishing advance in the training of the men themselves and in the scientific and technical manner of inspection which will indubitably result.

I believe the future of best food inspection work for our land lies in the good mutual understanding between the medical and veterinary professions as to their respective spheres of labour, and the recognition of this to a much greater extent than at present by Central Departments and Local Authorities.

I therefore welcome you here to-day to hear and discuss subjects of the greatest importance in this connection, and trust that the words said here will be of great assistance to those who have these matters in hand.

The Conference Papers.

We publish in the present number the paper on "Common difficulties in Practical Meat Inspection," presented to the Conference by Mr. J. McAllan.

Future issues of the *Record* will contain the discussion on the above and the paper by Colonel J. W. Brittlebank on "A Uniform System of Milk Inspection," and that by Mr. Arthur Gofton on "The Problem of the Tuberculous Cow." The discussions upon these papers will accompany them.

At the conclusion of the Conference Lt.-Col. T. Dunlop Young said: Before we go, may I be allowed to have the honour of proposing a very hearty vote of thanks to Colonel Leighton for his able conduct in the chair (applause), and at the same time to extend to him the thanks of the veterinary profession for his endeavour to bring us together, not to work in watertight compartments but to work in teams, not only for our own benefit, but for the benefit of the public whom we serve. (Applause.)

Mr. J. G. McGregor, Assistant Veterinary Inspector, Lanarkshire, in seconding the vote of thanks, said: I congratulate you on the success of the section. It is the most successful Veterinary Conference I have ever attended. I hope much will be the result, but whatever it is, your opening comment struck a very fine note, and it has been reiterated often, and I hope it will bear fruit; and that was your reference to co-operation. I feel sure it will be responded to; I am sure I am voicing the opinion of all those who are left and those who have gone in supporting the motion which has just been put to the Conference. (Applause.)

The President: If it be true, as my friend has said, that this Conference has been one of the most successful we have ever had, let me express my great gratification that it is so, but at the same time would you allow me to put the credit on the right shoulders? You cannot have a Conference of this kind without a great deal of work being done by someone, and I want to take this opportunity of thanking Mr. Hayhurst and all those who have worked so hard; and I also want to thank most heartily the list of splendid speakers who have kindly responded to the invitation to do what they have done. (Applause.)

Common Difficulties in Meat Inspection.*

By J. McAllan, M.A., B.Sc., M.R.C.V.S., Aberdeen.

It is almost unnecessary for me to say that the whole question of Meat Inspection is now of greater importance to us as a profession than it has ever been before, since recent legislation dealing with the inspection of meat has given the veterinary surgeon, definitely in Scotland at any rate, an established position as a meat inspector.

The difficulties that arise in meat inspection may be treated under various heads, and some of these I shall now deal with briefly.

I.—Administrative Difficulties.

1.—*Multiple Slaughterhouses* in his district will always be a source of difficulty to a meat inspector. The recent regulations in both England and Scotland have done much to lighten his task under this heading, by giving local authorities greater control over private slaughterhouses in the regulation of hours of slaughter therein. Yet every meat inspector who has private slaughterhouses in his district must confess that he has difficulties, since he realises that for the proper inspection of carcasses for the food of man, his presence, or that of an assistant at the actual slaughtering and dressing of every animal is necessary. With multiple slaughterhouses, thorough meat inspection is impossible, financial considerations precluding adequate staff in most districts. The difficulties of meat inspection where all slaughtering is not carried on under the eye of the inspector, arise not with the carcass that is badly affected with disease, but with the carcass which is so slightly affected, with tuberculosis, for example, as to be overlooked by the butcher, or, as far as pleura or peritoneum are concerned, not affected at all (and without their being affected, butchers are convinced that there should be little wrong), but which on examination of offal and glands may mean a generalised tuberculosis. Such cases are frequently met with, and the feeling of the inspector with multiple slaughterhouses to control is, that through no fault of his own he cannot carry out his duties in the way he wishes.

The remedy for the above difficulties is the establishment of public slaughterhouses in burghs and centres for slaughtering to supply the needs of rural districts, so as to ensure the inspection of all animals slaughtered. That would be the ideal.

2.—*Lack of Uniformity in System and Standard.* Although at all times decisions in the inspection of diseased carcasses must, more or less, depend on the judgment of the individual inspector, yet many difficulties would not arise if there were a recognised uniform system and standard throughout the country. Scotland has shown the way to the rest of Great Britain in establishing such a system and standard, and I am certain that all the meat inspectors here who work for local authorities in Scotland will support me in saying

*Presented to the Veterinary Inspectors' Conference held in connection with the Royal Sanitary Institute's Congress at Edinburgh, July, 1925.

that many of their difficulties in the actual inspection of carcasses have been lightened at any rate, since the introduction of that system. What is passed in one district in Scotland now passes in every other district—a state of affairs satisfactory to traders and to inspectors alike. The inspector's work is made easier in his dealings with the trader, who now knows that the inspector has a definite legal system to work on, and that his judgment is based on, and guided by, that system. Difficulties which arise with a change of inspector when no uniform system exists do not occur, at any rate to the same extent, with a uniform system and standard.

3.—*Premises.*

The general control of slaughtering premises, especially of private slaughterhouses, their cleanliness, and that of all implements used, and the handling of meat, frequently create difficulties for the meat inspector. It is part of his duties to impress on butchers what cleanliness is, and how necessary it is in all their work. I have found the difficulties in this part of meat inspection greatly lessened by learning that butchers, as a class, are very difficult to drive, but very easy to lead. They soon learn what the meat inspector's wishes are, if they are instructed in the proper way.

II.—Actual Inspection.

With regard to difficulties that arise in the actual inspection of carcasses, I have not much to say. Difficulties in this respect are generally individual and depend on the skill, training and experience of the inspector. Difficulties are, I am safe in saying, not common to the trained inspector. To the inexperienced, of course, innumerable difficulties crop up, but the inexperienced inspector is, or at least should be, the exception. With specific diseases, meat inspectors trained in bacteriology and pathology, as they should be, should have no difficulties in actual diagnosis, and none in deciding as to the fitness and unfitness for human food of carcasses affected with specific diseases. The uniform system and standard in Scotland, as I have already stated, is of inestimable help to meat inspectors particularly in dealing with specific diseases; and as an example of the working of this system, it might be profitable to give here the standard laid down for dealing with tuberculosis in bovines. Tuberculosis, I am sure, has always been a source of difficulty to meat inspectors in dealing with traders, who have such an imperfect knowledge, as a rule, of the nature of the disease, and who, in the days before meat inspection was so rigorous, considered "tubered" carcasses merely something on which they could show their special skill in the way of concealing and obliterating disease.

1.—*Tuberculosis as dealt with under the Scottish Regulations.*

Two conditions warrant total seizure—

(*a*) Tuberculosis with emaciation.

(*b*) Generalised tuberculosis.

Evidences of generalisation are:—

(1) Miliary tuberculosis of both lungs, with any evidence of tuberculosis elsewhere.

(2) Where lesions are multiple, acute, and actively progressive.

(3) Where there is multiple and widespread infection of the carcass lymph glands.

(4) Where there are diffuse acute lesions of both serous membranes (pleura and peritoneum) and any of the carcass lymph glands are enlarged or contain visible tuberculous lesions.

(5) Where, in addition to the presence of tuberculous lesions in the respiratory and digestive tracts, there are also lesions present in the substance of any two of the following:—spleen, kidney, udder (or uterus or ovary), testicle, brain and spinal cord or their membranes.

(6) Congenital tuberculosis in calves.

All cases of tuberculosis not included in the foregoing shall be regarded as localised lesions, and the parts containing the lesions and contiguous thereto shall be seized.

The above conditions are excellent guides to the meat inspector, and only care in carrying out the inspection is necessary to place practically every affected carcass in its category. That evidence of tuberculosis in a carcass in whatsoever degree, slight or great, necessitates a thorough and detailed examination of organs and glands, should always be in the meat inspector's mind.

2.—*Emergency Slaughter.*

This always presents difficulties to the meat inspector, since he but seldom sees the animal alive (most "emergencies," I find, do not become "emergencies" till about midnight!) and gets no other reason for the slaughtering than simply that the animal was ill. The carcass has to be judged purely on its merits, with little, often, from the viscera, to help the inspector as to the nature of the illness. Most inspectors, I am sure, have met such cases. Careful examination, with ribbing and quartering, is necessary, and it is often advisable to leave the carcass hanging for twenty-four hours after the first examination before coming to a decision. That an animal slaughtered in an emergency may frequently smell of some drug, foolishly administered to the animal *in extremis*, must be borne in mind. Such a drug may not, strictly speaking, be dangerous to health, but trouble is sure to arise to the inspector and trader alike, should meat tainted with drugs find its way to the public.

3.—*Septicæmia.*

The very wise regulations that insist on the notification of emergency slaughter in the case of all animals in England and, unfortunately, only of bovines in Scotland, are particularly necessary in this disease. Septicæmia as a disease, *per se*, is difficult to diagnose in a carcass, since the carcass may be firm, the flesh well set and of a good colour. The condition is most commonly associated with a septic mammitis or with a septic metritis. Hence arises the necessity for the retention of all offal to guide the inspector, more especially of the uterus in parturient cases, where the carcass may look particularly well. Total seizure in

cases of acute septic mammitis and of an acute septic metritis, is, of course, the rule, since the carcasses are septicæmic and readily decompose.

III.—Meat Marts.

Meat Marts in towns to which carcasses marked "For inspection in A," are consigned from rural districts where meat inspection is either non-existent or very unsatisfactory, are a source of difficulty, for frequently carcasses showing actual disease are found in marts with no offal to guide one as to the original extent of the disease, or only that part of the offal which the town inspector concludes was not actually diseased. In the interests of the public, carcasses consigned to meat marts with no offal, and showing signs of disease, should be seized, although the inspector may have the feeling that he may be dealing harshly in some cases, in that the presence of the total offal might have influenced his judgment to pass at least a part of the carcass.

My paper, I have to confess, is rather rambling and contains little of what the actual title probably indicates, but it is not easy to marshal difficulties which, as I have said, are individual. After all, meat inspection is now such a definite subject of study and has such a definite place in public health work, that its difficulties are naturally fewer than they were in the past.

Fees Deputation in Devon.

At a meeting of the Diseases of Animals Committee of the Devon County Council, held at Exeter, on August 25th, Mr. Davis (county solicitor) stated that the meeting had to consider the appointment of a full-time Veterinary Inspector or Inspectors under the Tuberculosis Order and Inspectors under the Milk and Dairies Act. He suggested that a Sub-committee be appointed to meet a Sub-committee of the Public Health Committee to discuss the matter. Under the Tuberculosis Order for half of 1914 £270 was expended in fees to veterinary surgeons and £180 in travelling expenses. For three-quarters of 1913 £224 10s. was paid in compensation, of which £110 5s. 5d. was recovered by the sale of hides and parts of the animals. In 1914 the amount paid in compensation was £159 5s., of which £54 was recovered. The Ministry would repay, under the new Order, 75 per cent. of the compensation.

Mr. J. F. Shelley thought that if all animals in the country had been inspected for tuberculosis a much larger sum would have had to be paid in compensation.

The Chairman, replying to a question, said inspections would be held for tuberculosis in all parts of animals, and not only affecting milk, and the Committee would have the same jurisdiction as under the Foot-and-Mouth Diseases Order.

The Chairman stated that, owing to the Committee reducing the fees, veterinary surgeons in the county went on strike. It was considered a serious position for the Committee to be in if there should be an outbreak of disease, and the surgeons agreed to carry on if the fees were not reduced, and if any new fees arrived they were made retrospective.

Mr. Davis said the surgeons adopted the attitude they did because the Committee reduced the travelling expenses from one shilling to sixpence a mile.

Mr. Ascott headed a deputation of veterinary surgeons, and placed before the Committee a scale of fees and travelling expenses which they considered the Committee should adopt for inspecting animals. They suggested that 9d. per mile for travelling should be allowed, and that the fees in some instances should be doubled.

After a lengthy discussion a Sub-committee was appointed to consider the details.

CLINICAL REPORTS.

Volvulus with Plurality of Intussusceptions in a Puppy.

By D. Buchanan, M.R.C.V.S., D.V.S.M.,
Edinburgh.

Subject.—Cross-bred Spaniel puppy, aged two months.

History.—The animal was purchased from a local Cat and Dog Home on 2nd August, and on the 8th the owner brought it to my surgery to be vaccinated against distemper. I may here state that a few days after purchase the puppy was found to be affected with lice, and appropriate treatment for these parasites was adopted at the time of vaccination. At this time, apart from lice infestation, the puppy appeared normal and quite happy, although perhaps less playful than one might expect. The conjunctiva was somewhat pale, but temperature was normal. At noon on the 12th, on which day I had arranged to repeat the vaccination,—I received an urgent 'phone message to visit the dog, the owner saying that it had passed a quantity of blood, and refused all food. On arrival the puppy showed signs of colic, the attacks being intermittent, while in the intervals the animal lay abnormally quiet. On attempting to make a digital examination of the abdomen, the lightest pressure over any region caused the animal acute pain and the manipulation was discontinued. Enquiry showed that on the previous day the puppy had eaten heartily about two ounces of cooked liver, finely minced together, with an equal quantity of biscuit meal, followed later by about four ounces of milk. During the same evening premonitory symptoms had become evident.

Diagnosis.—In doubt.

Treatment.—A mild laxative was given, following an interval after a hypodermic injection of morphia, and hot packs were applied to the abdomen. All food was withheld in the meantime. On the following morning as the patient still seemed to be in distress, an enema of warm saline was administered, and small repeated doses of chlorodyne given per os, while strength was maintained with beef tea containing small doses of stimulants forcibly given from time to time.

It was noticed that the enema caused straining and was not retained. There was increasing tympany with no diminution of the acute pain on palpation of the abdomen. Considerable quantities of dark blood-stained mucus were now passed at long intervals, the femoral pulse being 150, weak, thready, and running down. Straining was not excessive and only observed at intervals of an hour or longer. There was occasional vomiting of watery fluid. An acute intestinal obstruction was now suspected, and an immediate operation or the destruction of the animal advised. The dog was destroyed.

Autopsy.—A complete twist of the small intestine, constituting a veritable knot, was found situated three inches from the pylorus. The involved bowel

was very congested, and when an attempt was made to undo the twist, inflammatory adhesions were found to have made this impossible. An enterectomy performed during life would probably have been impracticable on account of the length of intestine involved.

On examining the large intestine, two progressive intussusceptions were observed. The first of these involved the colon which had been invaginated by the terminal portion of the ileum for a distance of six inches. The second intussusception was formed by the descending colon which had become telescoped into itself for a distance of eight inches. In both cases when the invagination was reduced the includedportion of gut was seen to be dark red, and almost black in places, very soft and swollen. No worms or foreign bodies were present. The stomach contained the little nourishment given, but the bowels posterior to the site of the twist contained only a little blood-stained fluid.

The writer is of opinion that the irritation caused by the lice may, by reflex nervous action, have been responsible for causing an abnormal peristalsis, which may or may not have been aggravated as a result of the meal consumed by the animal on the 11th August.

Be that as it may, as volvulus, even *per se*, is comparatively rare in the dog, the condition described was thought worthy of record.

Mummification of the Bovine Fœtus.

By W. L. Boyd, Minnesota.

(*Continued from Page* 710).

No attempt was made to locate the fœtus and no part of the fœtal sac or fœtus was ever observed. She was milked on May 18th, the flow amounting to eleven quarts. She was then turned into the pasture, where she fed quietly with the herd. The owner watched her carefully, believing she would carry her calf a few days longer. He removed less milk at each period as he was afraid to have her produce heavily before calving. No further symptoms of parturition ever developed, the milk secretion gradually lessened and the udder rapidly receded to the shape and condition which characterises the cow that has been dry for a long period of time. The general health of the cow was not affected. This animal came to our attention in November, 1923, while in consultation with the local veterinarian. We made a diagnosis of fœtal mummification and purchased the cow for investigational purposes.

She arrived at University Farm in January, 1924, in good condition. Her appetite was normal, she carried a good coat of flesh and there were no visible signs of any disease process. By ballottement we were able to outline, in the region of the right flank, a large hardened mass, pressing tightly against the abdominal wall. This structure covered an area of approximately 30 by 60 cm. The vaginal canal was narrow and very long, on account of being firmly pulled forward. The external folds of the os uteri were small, which made the attachment of uterine forceps very difficult. The entire cervix, which was apparently perfectly sealed, was tightly pulled down over the brim of the pelvis and immovable. Rectal exploration was of little value in determining the actual shape and position of the uterus as it was too distorted to be recognised. We were also unable to palpate the ovaries. All that could be determined was the presence of a large, rounded mass, tightly adherent to the floor and wall of the posterior right half of the abdominal cavity. With the exception of one small, soft area, approximately 10 cm. across, the palpable surface was very hard.

After several examinations the cow was destroyed and autopsied. The skin was removed and the carcass presented a fairly good condition for an aged dairy cow. On exposure of the abdominal cavity we discovered a complete torsion of the uterus, the rotation being to the right. The twisted or spiral-shaped portion was attenuated and, with the exception of scattered adhesions, was free of inflammatory changes. The uterus was represented in the form of a large, round structure to which the omentum was adherent. The uterine walls, with the exception of one, small soft area, were extremely thick, indurated, and showed little or no resemblance to the normal structure. The ovaries and uterine tubes, if present in any form, were not recognised. The uterus, with its contents, weighed 84 pounds, and when opened, a male fœtus was found, fully developed and slightly mummified. The uterus was incised and a small amount of a thick, serogelatinous exudate, the remains of the fœtal fluids, escaped. The fœtal membranes were dark brown in colour and gelatinous. The fœtal cotyledons appeared as dry, necrotic patches. The remains of the uterine mucous membrane were thick, leathery, and the cotyledons had been entirely absorbed. The uterochorionic spaces contained an organised serogelatinous exudate. The uterine walls varied in thickness from 1 to $2\frac{1}{2}$ cm. The fœtus adhered to the walls of the uterus in a few places. These attachments were very firm, and were separated with difficulty. A section of the uterine wall was prepared for microscopic study.

Microscopic Findings.

A microscopic examination of the sections showed the presence of only a small amount of muscle, intermixed with fibrous tissue, which was abundant. Eosinophiles in large numbers were found near the mucous surface. The uterine epithelium was missing. The uterine glands were absent, having been replaced with fibrous tissue. The gross appearance of the uterus resembled sclerosis, which was verified microscopically.

Discussion.

Mummification of the fœtus in this instance resulted from torsion of the uterus. The presence of a well-formed mucous plug in the cervical canal indicated that the canal had not been dilated. The size and development of the fœtus showed that asphyxiation

(Continued at foot of first column next page)

NOTES AND NEWS.

Diary of Events.

Sept. 22nd.—Joint Meeting of the North Wales Division and North Wales Branch of the B.M.A., at Chester.
Sept. 30th—N.V.M.A. Meeting of Council, 10 Red Lion Square, W.C.
Oct. 1st—R.C.V.S. Committee Meetings.
Oct. 2nd—R.C.V.S. Meetings of Council and Committees.
Oct. 19th.—Opening Ceremony, Royal (Dick) Veterinary College, Edinburgh.
Nov. 30th.—Notification of changes of address to Registrar, R.C.V.S.
Dec. 1st.—R.C.V.S., Examination Fees (December Exams.) payable.
Dec. 8th.—R.C.V.S., Written Examination.
Dec. 10th.—R.C.V.S., Oral Examinations commence.

We deeply regret to have to record the death of Mr. William Roy, of Parkhead, Glasgow, which occurred in a nursing home, after a short illness, on August 30th. Mr. Roy was one of the oldest and most enthusiastic members of the West of Scotland Division which has thus lost an able and popular occupant of the presidential chair. The interment was attended by the following members of the Division: Messrs. W. Robb, Hugh Begg, R. Mitchell, Jas. Macfarlane, J. G. Macgregor, W. Anderson, G. W. Weir and G. C. Hill. Mr. Ray graduated at Glasgow in 1895.

Frank Garnett Memorial Fund.

The Hon. Secretary of the Fund, Mr. Fred Bullock, writes: "In sending you the eighth list of subscribers to the Garnett Fund, I should like to direct the attention of members again to this Fund. As the number of subscribers up to the present does not exceed 120, it is clear that the majority of subscriptions have yet to be received. As the Committee will shortly have to consider the best means of utilising the Fund, and as this will depend almost entirely on the amount subscribed, it would help the Committee greatly if those who wish to be numbered among the subscribers to this deserving Fund would send in their subscriptions as soon as possible."

We confess to astonishment at the smallness of the number who have accorded the fund their support to date, as revealed in the above appeal, and we rely upon our readers to do their part, while there is yet time, to increase the proportion of College members who have contributed to this fund of the profession.

The eighth list of subscribers is as follows:—

	£	s.	d.
Amount brought forward from seventh list	310	19	0
H. J. Dawes and Son	2	2	0
J. F. Healy	1	1	0
A. E. Roberts	0	10	6
W. Nairn	0	10	6
W. Jackson Young	2	2	0
H. H. Curson	1	1	0
Corrigenda:			
Add P. J. Simpson ... 5 0			
Less A. J. Beeson 1 0			
	0	4	0
Total	£318	10	0

It is very gratifying to the profession and to the Royal Army Veterinary Corps that on the beautiful screen which has been erected in the Cathedral, Newcastle-on-Tyne, "To the Glory of God and in honour of the men of Northumberland who served in the Great War," the Corps, as represented by the Northumbrian Mobile Veterinary Section (Territorial) and the Veterinary Hospital (Territorial), has been inscribed under its own badge.

The Education Committee of the Royal (Dick) Veterinary College, Edinburgh, have elected Mr. Daniel Cameron, M.R.C.V.S., of Comrie, Perthshire, to the James Tindal Post-graduate Scholarship.

The scholarhip is endowed in memory of the late James Tindal, of Glasgow, who was a pupil of William Dick, the founder of the Edinburgh College, and is awarded each year to the most distinguished graduate of that year.

A meeting of the committee set up for carrying out experiments to immunise cattle against tuberculosis by the Spahlinger treatment was held at Crewe on September 4th. Many Members of Parliament and medical men were present. It was reported that shoals of applications for the serum had been received from all over the country, and Sir James Allen, High Commissioner for New Zealand, wrote that the tests were being watched with keen interest in the Antipodes.

(*Continued from previous page.*)

occurred at or near the termination of the gestation period. The inflammatory condition of the uterus which resulted in sclerosis was probably of a sterile nature. If there was bacterial invasion of the uterus, the type of inflammation produced was not sufficiently severe to interfere with the general health of the patient. The absence of extensive mummification of the fœtus indicated that a long time is necessary for the absorption of the fœtal fluids and membranes, when fœtal death occurs at the termination of pregnancy.

The symptoms exhibited by this cow, at the time she was due to calve, offer good evidence that expulsion of the fœtus was attempted. The fœtus inhabited the uterus for a period of twenty-nine months and would no doubt have been carried many more months had not the owner decided to dispose of the cow.

BIBLIOGRAPHY.

[1]Williams, W. L.: Diseases of the Genital Organs of Animals, p. 470.
[2]De Bruin, M. G.: Bovine Obstetries, p. 125.
[3]Bang, B.: The Etiology of Epizootic Abortion. Jour. Comp. Path. and Therap., 10-11, p. 135.

The nature of the tests was decided upon, but these will not be disclosed until proof is ascertained of their effectiveness. Thirty-five calves from herds which have passed tuberculin tests are to be purchased for the initial experiment, and Major C. Tomkinson, Willington Hall, Cheshire, offered the committee part of his farm to conduct the tests. The calves will be under the supervision of a special committee, including Sir John M'Fadyean, until they are inoculated and infected with the bacilli.

Cruelty to a Cat.

Hornchurch Woman sent to Prison.

At Romford, on September 3rd, Beatrice Barbara Boorman, Elmhurst, Wingletye Lane, Hornchurch, was summoned for subjecting a cat to an operation which was performed without due care and humanity, and for not causing the animal to be under some anæsthetic. Defendant said she operated on the cat without an anæsthetic, but was not guilty of cruelty.

Mr. Gordon Jones, for the R.S.P.C.A., said Mr. Tage Eigel Jorgensen, a neighbour of the defendant, owned a black Persian male cat, over six months old, and he considered having it castrated by a veterinary surgeon. On August 6th defendant approached Mr. Jorgensen's maid and suggested that she should be allowed to carry out the operation. She was told that this was not desirable as Mr. Jorgensen was going to take the cat to a veterinary surgeon. After the refusal, Mrs. Boorman obtained possession of the cat on August 9th and proceeded to carry out the operation in a most cruel and unskilful manner, and cut the unfortunate animal with a pair of scissors, taking no antiseptic precautions. The result was that peritonitis was set up, and it was fortunate that the cat did not lose its life. Defendant said she was an expert in this sort of thing, and had performed on animals before.

Mr. Jorgensen said the animal was doctored entirely against his wishes. P.C. Killworth said defendant told him, " I am an expert at it, and do all my own." Major J. A. Boseley, veterinary surgeon, said he examined the cat after the operation and found it to have a jagged, dirty, discharging wound, which was surrounded by considerable swelling. The organs had been removed in a very clumsy and unskilful manner, and the operation had been improperly performed.

Defendant, replying to the charge : I am awfully sorry, I did not know the cat was over six months old. It shall never happen again.

After a retirement, the Chairman (Mr. E. Bryant) said defendant would be sent to prison for one month and be fined £25. In default of payment she would serve another month.—*The Essex Chronicle.*

A recent issue of the *Evening Standard* contained the following :—

" I noted the other day the fact that Professor Bergson had fourteen doctors in connection with his ailment. Bismarck ran through ninety-nine before at last he came to Professor Schwenniger, who succeeded in reducing his fat.

" Even then the result was not achieved without much personal friction.

" Schwenniger, at his first interview, pestered his patient, the ' Iron Chancellor,' with so many questions as to his habits of life, that at last the Prince lost his patience, and said : ' You ask me too many questions.'

" ' Very well,' said Schwenniger, ' you go to a veterinary surgeon, as he won't ask you any.' "

R. S. I. Meat and Food Inspection Course.

The syllabus of the courses of lectures and demonstrations for the Autumn Term of the Royal Sanitary Institute is now procurable from the Director at 90 Buckingham Palace Road, S.W.1. The section for meat and food inspectors commences on Friday, October 2nd, and Col. T. Dunlop Young and Mr. J. R. Hayhurst conduct a comprehensive series of lectures on meat inspection, while they are also responsible for practical training in this subject.

The lectures are followed by the standard examinations of the Institute, which are recognised in all parts of the British Empire.

On the 14th July, the Kafue Gymkhana Club held its annual race meeting in connection with the Northern Rhodesia Agricultural Society's Show, which was opened this year by His Royal Highness the Prince of Wales.

In the Show Stakes His Royal Highness rode the mare Hetloo, which was only beaten by a head by Captain Gaskell's Bedford.

The finish was a very well ridden and most exciting one. Some half dozen lengths separated second and third and the rest of the field.

It is understood that this is the first race meeting at which His Royal Highness has ridden since he broke his collar bone some eighteen months ago.

Hetloo is owned by Captain R. Gorman, the local veterinary officer and had won at Lusahia some weeks previously.

The Prince's mounts, General Price and Hortense (owned by Captain John Smith, Chief Veterinary Officer, M.L.C.) were unplaced in ' The Hack's Race,' and in ' The Governor's Cup.'

Meat Regulations Test Cases.

The stipendiary magistrate at Stoke recently reserved judgment in a test case under the new meat regulations. The London, Midland and Scottish Railway Company were summoned for not causing persons employed in carrying meat to wear washable head coverings and overalls. Two motor drivers and a meat porter employed by the company were also summoned for not having their hands in a clean condition when handling meat.

The case for the prosecution was that the men were wearing dirty sacking aprons and had no head covering, and that their hands were dirty when delivering meat. For the defence it was contended that the handling of meat by a railway company did not come within the regulations.

In another test case the London, Midland and Scottish Railway Company were fined three guineas for failing to protect Danish bacon in transit by means of clean cloths.

Many of our readers will be interested in the autobiography of Squire Osbaldeston, which begins as a serial in *The Field* on October 1st. It will include quotations, in respect of the 200-mile ride, from *The Veterinary Journal* of 1831.

ARMY VETERINARY SERVICE.

LONDON GAZETTE. WAR OFFICE. REGULAR FORCES.

Sept. 4th—The following Captains to be Majors (Sept. 3rd) :—W. St. J. F. Macartney, G. A. Kelly, G. F. Steevenson, F. B. Hayes, O.B.E., and remains secd., F. Hogg, G. V. Holding, S. W. Marriot, O.B.E., and remains secd., F. J. Weir, J. Smith, J. R. Ellison, and remains secd., S. O'Donel, M.C., and remains secd., C. J. R. Lawrence, O.B.E., R. H. Knowles, and remains secd.

Sept. 3rd—The following Captains to be Majors (Sept. 3) :—H. E. A. L. Irwin, with precedence next above S. W. Marriott, O.B.E. ; C. H. S. Townsend, O.B.E., M.C., with precedence next below R. H. Knowles ; J. J. Plunkett, O.B.E., with precedence next below C. H. S. Townsend, O.B.E., M.C. ; S. L. Slocock, M.C., F.R.C.V.S.

CAMBRIDGE CONGRESS TRADE EXHIBITION.

It is regretted that the list of firms given in our Congress number as being responsible for stands at the Trade Exhibition did not include the Dental Manufacturing Company. This firm, making its initial appearance at the exhibition, had one of the best appointed stands in the hall, and one which was the centre of much interest.

PERSONAL.

Will. BEACH, Mr. Thomas William, M.R.C.V.S. (77), of Portman Avenue, East Sheen, Surrey (net personalty £18,893), £19,643.

CORRESPONDENCE.

Magisterial Criticism of Professional Fees.

TO THE EDITOR OF THE VETERINARY RECORD.

Sir,—With reference to the correspondence published under the above title in your issue of August 29th, although one may fully appreciate the feelings and *esprit-de-corps* of Captain Kirk, one may perhaps be allowed to sympathize with the ignorant and elderly poor, and to understand the truly humane impatience of Mr. Eliot Howard. During the past three years I have directed what, I trust, is an average intelligence to the observation of the shady side of police prosecutions for "cruelty to animals," and I know that the Chairman of the Bench of magistrates may have had good reason for saying that "It has seemed to me that costs are piled up in cases where veterinary surgeons are concerned."

The Chairman doubtless felt that a regulation fee of 15s. was too high a sum to be added to the fine for a possibly trivial offence by an impoverished old man, and that a multiplication of that fee would be intolerable if that multiplication were by any chance a matter of arrangement between the police constable and the veterinary practitioner.

Mr. Howard (the chairman), in short, felt that an Act of Parliament designed to prevent suffering among animals should not be manipulated to cause relatively greater suffering to human beings.

The Chairman of the Stratford Bench evidently discerned that there was some peculiar financial distinction about costs in "cruelty" cases. He had not observed, for instance, that in prosecutions where medical opinion was required in cases of drunkenness, or in other cases where fees for expert opinion were not payable, that the costs tended to multiply in so marked a fashion as in these "cruelty" cases. He had, he admitted, thought about this before and now, confronted with the sorrows and afflictions of a poor old man whom the law obliged him to convict, he blazed forth his suspicions, not knowing of the scientific eminence of our profession and not caring for the bureaucratic regulations of the police.

Captain Kirk and the Chairman of the Stratford Bench are both honourable men looking at the same thing from a different angle, but I think that the latter has a better sense of proportion. What he lacks as compared with Captain Kirk in exact knowledge of the status of our profession, he gains in having the common sense to recognise that in a case where justice was met by a conviction with a fine of one shilling, police costs amounting to £3 17s. could not reasonably be allowed, and that there seemed to be something wrong about a system which permitted such an absurdity.

The smoke of remarks of a disparaging sort, that are made from time to time by London magistrates, arises from a hidden smouldering fire that must be stamped out before we as a profession can hope to take the high position which Captain Kirk claims and for which I yearn.—Yours faithfully, JNO. RAINEY,

20 High Street,
Bow,
London, E.3.
1st September, 1925.

The Tuberculin Tests.

TO THE EDITOR OF THE VETERINARY RECORD.

Sir,—Mr. Catmur's letter dated August 17th, which appeared in your issue of August 29th, must surely, as far as the comparative cost of the subcutaneous and the double intra-dermal tests is concerned, apply to a specific type of practice and not to practices in general.

A single-handed practitioner cannot easily leave his practice and remain on a farm taking temperatures until the test is complete, nor can he easily control his day's work so as to let him take temperatures at the proper times when he tries to do his other work in the intervals between temperature taking.

It is this last fact which has unfortunately allowed some men to succumb to the temptation of writing certificates partly based on temperatures taken by owners or cowmen.

The subcutaneous test, carried out precisely as advised by the R.V.C., London, has, in the hands of my firm proved itself capable of establishing tubercle-free herds. It is admitted that one is not confronted with the dope question when the owner is out for freeing his herd from tuberculosis.

If, however, the intra-dermal test, as suggested in the report of the Ministry of Health, proves to be as accurate as the subcutaneous test, I think it must win, because practitioners in general will be able to carry it out without upsetting their work to anything like the same extent as does the subcutaneous test. It will remove the temptation referred to above. If the simple procedure for the double intra-dermal test suggested by Mr. Catmur is sufficient, and something like it probably is, although I do not quite agree with the precise hours he mentions, then at a reasonable distance from home it should be possible to do this test more cheaply than the subcutaneous test.

Working in one's own area, I take it that the scale agreed on by the local branch of the N.V.M.A. should be observed, and although I do not know of a scale being published up-to-date for the new test, I shall be very surprised to find a higher scale adopted for it.

It will not be disputed that a veterinary surgeon, when sent great distances from home, will have to charge more for the intra-dermal test than for the subcutaneous test because of the number of days he will be away from home, but that is exceptional work compared with ordinary everyday testing.

I suppose that when one is sent longer than the average distance for a special purpose, in the area covered by the local branch of the N.V.M.A., it may be regarded as sufficient if the charge made exceeds that of the nearest practitioner, but I do not remember that point having been raised.—Yours faithfully, S. J. MOTTON.

Penzance,
7th September, 1925.

National Veterinary Medical Association of Great Britain and Ireland.

EDITORIAL OFFICE : 10 Gray's Inn Square, London W.C.1.

Cheques should be made payable and all communications sent to the General Secretary at the Offices of the Association, 10 Gray's Inn Square, London, W.C.1.